THE MIND OF MAN

BEING

A NATURAL SYSTEM

OF

MENTAL PHILOSOPHY.

BY

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'Learn me true understanding and knowledge.'—Ps. cxix. 66.

Illustrated with Engravings.

LONDON:
GEORGE BELL AND SONS,
YORK STREET, COVENT GARDEN.
1875.

TO

THE THOUSANDS OF READERS

AT HOME AND ABROAD,

WHO HAVE

CONSULTED MY PUBLISHED WORKS,

This Volume is Dedicated

BY THEIR GRATEFUL SERVANT

ALFRED SMEE.

PREFACE.

THIRTY-FIVE years ago I conceived the idea of studying mental phenomena in connexion with the organisation of the human frame.

An early study of the brain, nerves, and organs of sensation, exhibited to my mind the voltaic character of the nervous system; and during this investigation, the beautiful method of injecting the smaller blood-vessels by carmine was discovered, which gave us the first exact knowledge of the distribution of the capillaries through the brain and spinal chord.

My attention was next given to the study of voltaic electricity, which led to the invention of the form of battery which bears my name, and to the development of my work on Electro-metallurgy which has been employed in the arts.

The relation of Physical Forces was next studied,

and as the result of those labours the doctrine of the Monogenesis of Physical Forces was developed and published in my treatise on the 'Sources of Physical Science.'

After much consideration, and the bestowal of intense and concentrated thought over a long period, I developed my natural system of mental philosophy, wherein the laws of mental action were attempted to be ascertained by a consideration of the structure and functions of the brain, the nerves, and of the organs of sensation, on the one hand, and by a study of the laws of electricity on the other.

Later, a paper on the Human Mind was written, and the principles of mental phenomena were described in a popular form, in a treatise entitled 'Instinct and Reason.'

For the purpose of studying more intimately the organs of sensation, vision was made the subject of particular attention, and the results of my experience were published in a monograph which particularly describes the researches on Binocular Perspective.

The treatise entitled 'The Process of Thought adapted to Words and Languages' was next developed, which contains an account of the relational machine whereby most logical inductions and deductions can be obtained by mechanism.

A lecture delivered at the London Institution, in Finsbury Circus, on Education, and another on the Monogenesis of Physical Forces, completes the series of books which have been particularly noticed in this volume.

The substance of these above-named works, so far as immediately appertains to this book, has been incorporated into the present volume, which thus comprises, either in detail or in general principles, nearly everything which I have written on the subject.

Every treatise designed for the study of a natural system of the human mind must, of necessity, deal with natural religion; and it will be ever an important matter to test by pure reason that which is taught by religion, that we may be confirmed in a sure faith.

During the last half century we have passed through the greatest physical period which the world has ever seen. Electro-telegraphy, photography, electro-metallurgy, the steam locomotive, and the development of the laws of chemical combination and the physical laws of matter, have made great strides in the history of man.

Indications now exist that a metaphysical period is at hand, which may be as great in the future for

metaphysics and moral philosophy as the past has been for physics.

In view of the coming change, this treatise has been written as a contribution to mental philosophy, that we may conduct on a sure basis the discipline of our minds, the education of our youth, and the government of mankind.

I am indebted to Dr. Stewart, Dr. Ferrier, and Mr. Jonathan Hutchinson, for some of the illustrations of the structure of the nervous system; and to my daughter, Mrs. Odling, for the analytical Index.

7 *Finsbury Circus,*
18*th February,* 1875.

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ELEMENTARY IDEAS.

Ideas from sensations—Eye-sensations, extent of—Ideas from two eyes—Ear-sensations—Number of notes heard—Taste-sensations—Odour-sensations—Feeling-sensations—Sensation-carriers, or nerves—All external forces become nervous in the body—Combination of nervous impressions—Changes of combination—Idea of time from nature of change—Cause—Pleasure and pain—Memory—Reason of Man—Natural reason—Reason by words.

THE mind derives the most elementary ideas or mental pictures from all things existing in the external world through the medium of the organs of sensation. These may be conveniently termed aisthenic ideas, from the word *αἰσθήσις*, sensation, and comprise those representations which are carried to the brain through the medium of the nerves from impressions made on the eye, ear, nose, tongue, and skin.

EYE SENSATIONS, OR OPSAISTHENICS.—The ideas derived through the eye are the most important, as a photographic image is formed on the retina, and the picture so produced is carried to the brain where it is indelibly fixed. When

we look at an extensive prospect we are delighted at the perfect picture which we see. The minutest detail is accurately delineated, and the objects themselves appear to us in the various colours which comprise the spectrum. Nevertheless when we minutely scrutinise the mental picture, we are as astonished at the limited range of the entire prospect which is revealed to us at one instant of time as we are with the perfection of that picture within the range for which the eye is adapted by nature to receive it.

The eye sees without motion at a glance every object contained within a circle of the diameter of $\frac{1}{25}$th of the distance of the object from the eye; that is to say, we see without a movement of the eye every object of one inch at twenty-five inches distance, or every object contained within the circle of a mile at twenty-five miles distance. In mathematical language, perfect vision is obtained over a range of 3° 18′.

Beyond this circle of complete vision objects are more indistinctly seen the farther they are removed from the centre, and in my treatise on the Eye exact details are given of the pictures formed in my own organs of vision. Within the range of perfect vision, however, the eye only perceives objects, or parts of objects, of a certain magnitude. For instance, at fifty feet distance the total range of perfect vision is contained in a circle two feet in diameter. At twenty-five inches the circle is restricted to one inch. Within this circle, and at that distance, we can discriminate parts not less than $\frac{1}{250}$th of an inch diameter.

This limitation of visual power proves that any mental picture can only contain a definite number of parts. The picture on the retina is similar to patterns used by needlewomen, though on a more minute scale.

In the study of the mind it has been convenient to

assume that the limit of the perfection of vision is a square instead of a circle, and that this square if measured is the $\frac{1}{250}$th of the distance from the eye. From this it follows that at $12\frac{1}{2}$ inches from the eye one square inch comprises the range of perfect vision, and the ultimate parts of which this square is composed are the $\frac{1}{250}$th inch across. By multiplying 250×250, we have in this space of perfect vision 62,500 squares, which are visible, and on each of which an impression may be made and carried by the nerves to the brain.

Now the visual square divided into its 62,500 parts, and impressed with a picture, resembles the pictures used by needlewomen. If a number be assigned to each ultimate compartment, the squares implicated in any picture may be designated, and the result communicated from one person to another, the minuteness of each ultimate compartment being the only barrier to an exact representation of any picture seen by one person being communicated to a second.

For example, a rectangular square may be divided into nine parts, then we shall find if some are black and the remainder white, and if each is distinguished by a definite number, that if the following squares are black, 1, 2, 3, 4, 6, 7, 8, 9, the letter D would be represented. If 1, 2, 3, 4, 6, 7, 9, the letter E; if 1, 2, 3, 5, 7, 8, 9, H; if 1, 3, 4, 5, 6, 7, 9, I; if 1, 2, 3, 6, 9, L; if 2, 4, 6, 8, O; if 1, 4, 5, 6, 7, T; if 1, 2, 3, 6, 7, 8, 9, U; if 1, 3, 5, 7, 9, X. The numbers of each ultimate compartment acted upon can be told to any other person at any distance or at any future time, when the particular spaces can be filled up in black, when a second picture can be made identical with the first. By imitating the natural operation of

1	4	7
2	5	8
3	6	9

Fig. 1.

the nervous system, a secret language could be used, which the genius even of a Young who was so skilled in deciphering secret languages, might have failed to have discovered.

Each compartment might be described trigonometrically as well as arithmetically, as each compartment has a definite relative position to every other compartment.

Not only letters, but distinct pictures, might be described, were it not too laborious; in truth, any picture seen by the eye of one person could by assigning a designation to each compartment be so described as to be capable of being repeated, so as to be understood by any other person, as in this diagram of one hundred parts.

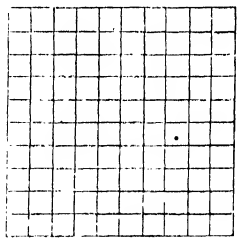


Fig. 2.

Whenever an object in the external world produces an image on the retina of the eye, smaller than the ultimate compartments of which it is composed, it is invisible, unless the image is increased in size either by the telescope or by the microscope, and that which is not depicted in the eye is not appreciated by the brain. Our knowledge derived by vision is therefore limited, as we can only obtain information from the eye when the object is of certain defined magnitude.

Not only is our knowledge limited by the size of the object, but also our power of discriminating colours is limited to the rays which we designate red, orange, yellow, green, blue, indigo, violet. Chemistry reveals that there are other rays less refrangible than the red rays, and more so than the violet, which are not visible to the eyes of men.

The mind obtains information from the images formed in the two eyes, because the two eyes, being $2\frac{1}{2}$ inches apart, are placed at two stations, and a somewhat different image is

Fig. 3.—AN INNER COURT OF THE BANK OF ENGLAND.—Page 5.

formed in each. An inquiry on this matter, although proper in a treatise on the Eye, need hardly be continued in a work designed for a study of the mind further than to remark that the mental picture derived from the two eyes combined reveals more of each object viewed than the picture derived from one eye alone.

The eye considered by itself is a mere optical arrangement or camera, containing lenses for the formation of the image, contrivances for adjusting the lenses to various distances, and optical combinations to render the eye achromatic and to correct spherical aberration. In the manner in which the eye does its work, it is as far superior to the camera of the photographer, as all other works of nature are superior to the contrivances of man.

The accompanying engraving of an inner court of the Bank of England is copied from a photograph taken at one station for one half the time the process was required, and then at a second station, 2½ inches distant from the first position. By this plan of operation two distinct pictures were formed and combined together to form a picture such as the two eyes see.

From an examination of the finest pictures in many of the most celebrated galleries in Europe, I have been able to detect the method by which various distinguished painters represent what is seen by both eyes at once. For example, Paul Veronese most skilfully obtains the effect of solidity by the suggestion of a line more or less broken to conceal his artifice outside the limbs of the figures which he has represented.

The picture formed on the retina by itself renders us no wiser for possessing an eye with all its marvellous contrivances. Some change, however, during the act of vision, takes place, which occupies a period of time which has been

found to be $\frac{1}{10}$th of a second. This sets in motion a force which my experiments have led to infer that it is of a voltaic character. By this the picture is carried by a separate nerve for every compartment of the retina to the brain, whereby the mind becomes cognisant of the picture formed in the eye, and we obtain a knowledge of the objects in the external world when lit up by any one or all of the various colours of which light is composed. Light, therefore, is that physical force which causes the picture to be formed upon the retina, and is the origin of the motive power by which a knowledge of that picture is carried to the brain where it is fixed for the mind to apprehend it.

Man is not singular amongst animal beings for deriving knowledge from the eye. It is, however, truly his best sense, and deprived of it, he may say with Milton,—

'Knowledge at one entrance quite shut off.'

Some creatures, as birds, appear to possess the faculty of sight to a more perfect degree than any man with regard to the size and distance with which they can discriminate objects. Other beings, on the contrary, as the mole, the flea which lives on the mole, and the Proteus, have no perfect eyes, and cannot have those pictures of the works of nature brought to their knowledge which man has.

To what extent animals can appreciate colours it is difficult to tell; but experience shows that the bull is excited by the red flag, and the tortoise runs to the yellow flower.

The mind is influenced to an important extent by the ideas obtained through vision; but when deprived of sight, the sufferer might say with Milton,—

'So much the rather thou, Celestial Light,
Shine inward, and the mind through all her powers irradiate.'

Ear Sensations, or Ousaisthenics.—The mind does not derive so many ideas through the medium of the ear as it does from the eye. The ear, however, is of great importance, and it is particularly noticed that the deaf man is liable to accidental injury. He is often injured by vehicles and horses, the noise of which he does not hear, and therefore does not sufficiently quickly avoid.

The range of musical sounds appreciated by the ear consists of about $12\frac{1}{2}$ octaves, and in each octave many persons can distinguish the $\frac{1}{32}$d of a note. Upon this hypothesis the human ear can distinguish about 3200 musical sounds, and no more.

At any one moment of time various sounds impinge upon the ear, as we may know when we hear the notes of a full orchestra.

In the consideration of sounds conveyed to the mind by the medium of the ear, we must exclude conversations by words and language, which are really sounds used to represent mental ideas, and which require special and separate consideration.

There is no reason to suspect that the members of the higher animals are either much better or worse off than man in the appreciation of sounds, very high tones, however, greatly excite some animals.

The importance of vision and hearing to the mind of man is so great, that when unfortunately born without both he is not competent to transact any business.

Taste Sensations, or Gumaisthenics.—The mind does not obtain many ideas by the sensation of taste, the object of which appears to be to enable animals to distinguish food fit for use from that which is deleterious. It has never been attempted to ascertain how many specific savours man is competent to distinguish.

Odour Sensations, or Rhinaisthenics.—Many animals far surpass man in the faculty of deriving knowledge by their nasal organs. The cat manifestly finds its prey by scent. The dog hunts by the power of smelling the tracks of the creatures it devours. It is manifest that the nose of the dog and cat is far more sensitive, and is capable of affording a much larger knowledge to them, than the nose does to the human being. Nevertheless odours indicate to us the presence of various substances, and enable us to discriminate various states of the same substance, as fresh meat from that which is putrid.

Feeling Sensations, Cœnaisthenics and Somaisthenics.—The mind appreciates two distinct kinds of feeling sensations. One set of impressions which are derived from the action of physical force upon the skin, as when we receive a blow, or when the skin is acted upon either by heat or by cold; a second set of impressions, when the changes going on within our own bodies are carried to the brain, and are recognised by the minds, as when our minds distinguish the amount of any muscular movement. Our capacity to appreciate the changes which are taking place within us are but limited in extent; and it is possible to conceive that, had we but a higher mechanism for this purpose, we might have a more extensive knowledge of the changes which occur, although we must also admit that what we have is ample for our purposes.

Sensation Carriers, or Nerves.—The organs of sensation are simply arrangements by which light, sound, odour, savour, heat, cold, act upon the body. By themselves these organs are useless, and if further mechanism did not exist they would not afford any ideas to the mind.

In these organs of sensation some material change takes place on the action by their appropriate irritant which is not

exactly known. For instance, the nerves of the retina are affected by light, and this change produces an effect which is transmitted through carriers called Nerves to the brain. When these carriers, or nerves, are cut, no mental impression is produced, even though the organs of sensation remain entire, as it is essential that there should be a perfect nervous communication between the organs of sensation and the brain before any information can be conveyed to the mind.

As the nervous terminations in each organ of sensation are limited in number, so also are the little tubes, or carriers, to the brain limited, although it has never been accurately ascertained how many of these little tubes carry the impressions of the external world from all the organs of sensation to the brain.

Although light, sound, heat, odour, savour, act upon the senses designed to receive their respective impressions, yet the specific character of each of their physical forces is lost when the result of the change in the organs of sensation is transmitted through the nerves to the brain.

At any one moment of one's life many terminations of the nerves are acted upon, and this combination may be termed Syndramic, and is the result of all the actions on the ultimate nervous fibrils at any one instant of time.

When the brain is once impressed, the image formed on the organ of sensation, such as the eye, remains fixed in that part of the brain designed to receive the impressions of that organ, and may reappear to the mind at any future time. Impressions conveyed to the mind by the medium of the senses are more fixed and more decided than ideas which are communicated by other persons, by words either spoken or written. As good impressions may remain for life, and those which are bad cannot easily be neglected, it is a matter of paramount importance to subject ourselves to those

scenes which are capable of producing good and pleasing pictures hereafter.

The mental combination of nervous impressions received at one instant of time is ever changing, and never remaining the same for a single instant. Some remain, others come; the latter vanish, the second come again, and every possible variety comes into play. Take, for example, the picture of a garden formed on the retina. The general outline of the garden remains from year to year. In winter, however, the trees are leafless. In early spring birds sing, and flowers and leaves are added to the picture. The blossom passes away, and fruit is added to the scene, which passes away; then the leaves are removed, when perhaps snow covering the branches is again added to that part of the picture which never changes. What a series of pictures is here realised by the mind, not two of which are exactly identical even on the same day, yet every one is presented to the mind like a needlewoman's pattern.

The change of pictures, if narrowly examined, is but a limited change. As I sit in my room now writing, the articles of furniture and form of the room remain unchanged; but one visitor enters and another emerges, so that whilst the greater part of the picture, formed in the eye and carried to the brain, remains the same, another portion of the picture has some part added or subtracted. An intelligent appreciation of the continued change of images, as we shall hereafter find, leads to our notions of time; and pictures remaining without change involve much time, pictures with many changes little time for each event.

Again, the mode in which the changes occur leads to the idea of cause. For example, we see a blacksmith with uplifted hand holding the ponderous hammer; then another set of images of the arm and hammer in the act of falling; then a

picture with the hammer against an object struck; lastly, the object struck and changed in form. All these combinations of the actions on the primitive nervous fibres are simply variations on the particular ultimate portions of the nervous expansions, which are acted upon by the forces of the external world, and carried from thence by the nerves to the brain, where they either cause immediate actions or are available for future mental reappearance and objects of thought.

Whether the combination of the action on ultimate fibres in a combination of actions on the ultimate nervous fibres of the eye, the ear, the nose, or other sense, is immaterial to the study of this subject, because the moment the action is transferred to the brain it becomes a brain-impression, and loses its specific character.

Each single brain-impression may be designated by a number, and upon the supposition that the ultimate nerve-terminations in the body amount to 100,000 units of sensation, we should have an equal number of nerve-terminations in the brain, and any possible combination may be reported to the mind at any one instant of time.

The particular nature of the change which takes place in the brain, by which a material effect is produced in the bodily organisation is unknown, though physiologists are agreed that it takes place in the grey matter of the brain, which is abundantly supplied with blood-vessels, as my beautiful carmine injections have demonstrated.

Pleasure and Pain. — Every action in the nervous system is attended with the sensation of either pleasure or pain. Every moderate action in the nervous system is pleasurable — every excessive one is painful. Moderate light falling on the eye gives pleasure, the direct light of the sun gives pain. A genial warmth acting on the skin is attended with pleasure; great heat causes exquisite pain.

Painful and pleasurable sensations depend upon degree, that is simply on the extent of action produced on the nervous terminations; and, although so different in the effect conveyed to the mind, are merely differences of the intensity in which the external physical forces affect the organs of sensation. Pleasure and pain are the keys to human action. We all avoid pain and seek pleasure. Present pleasure, present pain—future pleasure, future pain—infinite pleasure, infinite pain—govern all human operations.

Memory.—The pictures transmitted to the brain are not transient, but are fixed in the organisation and appear hereafter. The first image was so registered on my brain at a very early period of my existence. I remember to have been taken from my bed to witness the illuminations at King George the Fourth's coronation, which occurred on the 19th July, 1821. As I was born on June 18th, 1818, I can fix an event as registered in the mind when only three years old. Before that circumstance, doubtless other facts which were impressed on the brain have their influence on the mind; but I have no means of determining whether such ideas were received before or after that period. The registration of pictures is of paramount importance to mental phenomena. Without it the mind would be a dreary blank, as we could not compare a present with a past event, or judge in any way of the difference between them. Without it we could not exercise the power of reflection or imagination. Without it we should be deprived of the power of acting upon all the facts which we have learned during the whole of our lives. Without it we should be said to be fatuous, a state in which a man is lowered to the condition of a plant.

When a new idea is communicated to the brain, it commingles, as it were, with all those ideas which have been received before, and modifies our subsequent thought. In a

state of rest, but yet awake, when we do not derive impressions from the external world, the mind is still active. For example, when we lie in bed the pictures which the mind has received from a garden reappear as plainly as though they had just been seen. From a consideration of them, we can form in the mind new ideal pictures which we can call to memory at a future time, and can go to any garden and construct in the external world at any future time.

It is my custom to write books, as it were, in the mind as I move about in my ordinary avocations of life. When composed in the mind, it subsequently becomes a mere question of mechanical labour to transmit to paper those ideas when thought out; and so mechanical is the act of writing, that I frequently find myself using the pen on important matters whilst conversing with those around me on the ordinary trivial subjects of the day.

The phenomena of memory should induce us all to register in our minds good images, for the occurrence of those which are pleasant constitutes a constant source of happiness and joy, whilst the memory of painful images is as frequently a source of misery and woe.

The spontaneity with which pictures reappear is difficult of explanation, for we cannot really understand by what influence the reappearance of the picture of a lovely plant or of a beautiful scene, which was seen perhaps months or years before, should come before the mind whilst we are sitting in our library miles away from the actual scene in the external world. Nevertheless we must admit the fact that whatever we have seen in the external world we can see again by the mind, and render available for future thought or for the control of our future actions.

The mind takes notice of the sense with which knowledge has been acquired, and distinguishes whether information

has been received from either the eye, ear, nose, tongue, or skin, or from any possible combination of these organs of sensation.

Without memory there can be no mind, as then the past can have no influence over the present nor be able to guide the future.

In the reappearance of pictures before the mind, two or more somewhat dissimilar frequently appear together, when the examination of the likeness or difference between the two is termed comparison, and is a higher power of the mind than the mere registration of mental pictures for memory. After comparison comes selection, and the act of selecting and choosing it for action is called judgment.

All these cases of mental action are common to all animals. A dog compares two homes, selects one, and upon that judgment acts. In these reasoning powers the human mind is not superior to that of the lower animals.

The intermediate state of the mind between the reception of ideas and the action of the body, either to guide the arms or legs to motion or the tongue to speak, is not well defined. Sometimes the mind pauses for some time; it dwells upon a subject, and defers action for a long period in the future.

How we act in this intermediate state is extremely curious, for the mind decides us to act, and yet the action may be delayed for an indefinite period. I determined to write this work some years since, actually wrote a considerable portion, but postponed the completion till the present time.

The action upon the entire ideas existing in the brain may be likened to the resultant of mechanical forces. Some tend towards one line of action, some towards another, but the sum total produces a line of thought between the whole combined. When we come to a determination upon all the

ideas reflected in our minds, we are said to act from common sense, a faculty not sufficiently practised by any of us, as we are apt to be led to wrong conclusions by giving too great weight to special facts or to a part of the impression in our mind in place of bringing into operation all ideas which we have derived during the whole of our previous lives.

Up to this point the mind does not differ from that of the brute beast, which sees, hears, feels, and remembers, what it has seen, heard, and felt, and which regulates its action after reflecting, comparing, and judging of the various ideas which it recollects.

MAN REASON; NOEMIC REASON.—There is a jump in the powers of mind between the human reason and the reason of brutes. The mind deals with its various ideas, and forms abstract conceptions. It forms the notion of mankind apart from any particular man. The notion of heat apart from hot things; of light apart from illuminated bodies. The capability of using these higher abstractions confers upon all men powers not possessed by the lower animals. Mankind alone of all the animal creation uses words and language for the communication of ideas; employs fire to cook food; lamps to illuminate rooms; electricity to convey intelligence, or tools by which mechanical force is regulated.

The mind evidently reasons by two distinct methods.

NATURAL REASONING.—By natural reasoning the mind concentrates its attention by the organs of sensation upon a matter, and forms its conclusion by the immediate images presented to the mind in comparison and in combination with all other images previously received. This is perhaps the more common method of reasoning. The whole train of thought is performed without the use of words or language. The rapidity of the conclusion is not only remarkable considering the large amount of premises on which it is based

but is more excellent than the slower and more tedious method of reasoning by words and language.

The conclusion in these cases flashes before the mind, and is so indelibly impressed that it can be fought against any disputant at any future time. It is employed usually in medical science. Occasionally I have been occupied hours in a journey to examine the state of a patient as to the progress of the case, and the conclusion has been formed in an inconceivably short space of time. Sometimes I should have been thankful to be relieved of the fatigue of the journey, but this has been required because of the difficulty of receiving communications of the exact state of the case by words and language.

Many medical men in large practice use the method of reason by their minds in this manner to such an extent that when placed in a witness-box to explain their train of thought, they so far break down that, though greatly eminent as medical men, they appear before the court as stupid witnesses.

The natural process of reasoning is far superior to the process by words and language, and all of us should practise its employment on all possible occasions. It constitutes the difference between the reason of the practical man and that of the man who has his knowledge from books and reasons by words.

CHAPTER II.

IDEAS ORIGINATING IN THE MIND ITSELF.

Instincts—Spontaneous Ideas—Ideas of States of Matter, of Modes of Motion and of Physical Forces—Ideas of Modes of Human Action and of Thought—Ideas of Infinity, of God, of Heaven, of Hell.

Various ideas evidently come before the mind by the natural process of thought arising from the construction of the brain itself. In our earliest infancy we take food without experience and drink because we are thirsty, although we have no knowledge that food will stop hunger or drink satisfy thirst; we move about when we are restless and rest when we are tired. Although there may be several instincts of the above character, I never could detect, either in my own mind or in that of any other person, any instinct similar to that which exists in the bee to guide it to make its honeycomb, in the wasp to make its paper nest, in the beaver to build its home, in the bird to migrate at one season to distant lands and return at another season to its former abode.

These and similar instincts appear to be distinct ideas implanted in the organisation of animals, and are applied in action in a perfectly automatic manner by the same species for thousands of years without variation, or only with that limit of variation which is noticeable in all the works of nature, except that the details may be somewhat modified by

the faculties of mind which are undoubtedly assigned to every living creature. The situation of a nest of a bird is chosen by reason, the nest itself is built upon a type or general design obtained by instinct, but modified by the

Nest of Ploceus Pensilis.

Fig. 4.

Wasps' Nest.

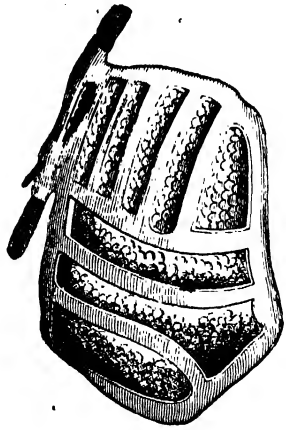


Fig. 5.

materials which the bird is able to procure for its construction, or by the form of the branches on which it rests. A pendulous bird's nest (fig. 4) is a good example of the result of instinct.

A remarkable instance of the effect of instinct in regulating and modifying action may be seen in a nest of a paper-making wasp belonging to Mr. Bowerbank. The nest

is invariably constructed tier by tier arranged vertically downwards. The branch on which the nest was fixed, by some accidental circumstance, broke, and the nest was thrown out of its position. True to instinct, the creature still formed its layers of cells working in horizontal layers, and thus the nest was constructed in two axes, one of horizontal layers of cells placed one above the other for a certain distance, and then when their horizontal position was no longer maintained, by other layers laid horizontally at an angle from the first set of layers. This operation was an instructive example of pure instinct (fig. 5).

Many ideas appear to arise spontaneously in the mind during the course of its ordinary operation. Thus the idea of matter is obtained from that which acts upon the organs of sensation, of number from the nervous filaments excited to action. So also the ideas of form, volume, composition, cohesion, crystallization, hardness, softness, solidity, fluidity, position, are derived from the manner in which the ultimate elements of the organs of sensation are acted upon by particular forms or conditions of matter when those actions are carried to the brain and registered therein.

The mind recognises also modes of motion, which, as they occur, are called electricity, galvanism, magnetism, chemical action, heat or cold, light, colour, or darkness, sound or silence, and the general power by which matter influences other matter gives rise to the idea of force. The relative rapidity in the changes of matter originates in the mind the idea of time.

The changes which occur in organic bodies suggest to us the idea of life and the absence of change—death.

From the different modes of human action ideas are formed of courage, cowardice, confidence, fear, rashness, prudence, justice. The state of the mind affords us the ideas

of meekness, irascibility, arrogance, modesty. Differences in our conversation suggest the ideas of ability, folly, pleasantry, ribaldry, buffoonery; of our mode of life suggest the notions of temperance, drunkenness, gluttony, abstinence; and our conduct one towards another gives rise to the ideas of kindness, cruelty, liberality, prodigality, ostentation, meanness, magnanimity. The comparison of one set of mental images with another affords the ideas of truth, falsehood, error, conviction, belief; and the further comparison involves the idea of conscience, by which we tell whether a thought or action is right or wrong. Accordingly, as extraneous matter acts upon the organs of sensation, we derive the ideas of pleasure or pain, and from a consideration of painful or pleasurable impressions the ideas of good or evil, of virtue or vice, of joy, happiness, or misery, come before us.

There are a vast number of these ideas which appear spontaneously to the mind, to which there can be no occasion at the present time to draw particular and special attention further than to remark the fact that the ideas of these so-called principles are constituted by the mental operation of the mind itself.

The totality of all actions on the nervous system appears to the mind as infinity. When this idea is associated with cause an Infinite Cause or God appears to the mind; when associated with time infinite time or eternity appears. The association of infinite time and pleasure gives to us the idea of heaven—of infinite time and pain of hell.

These ideas occur in the ordinary operation of the mind, and come before us without teaching. They are, as it were, implanted in us by virtue of the mode of construction of our brain. We cannot discard these thoughts, nor do I believe that any man of unimpaired intellect can separate them from himself during the whole period of his existence.

It is quite true that, reasoning by words and language, men have sometimes denied the existence of a God, of a future state, of heaven, or of hell. To reason by words is inferior to the reason by the mind, and such special peculiarities of belief, contrary to the intuitive belief of all mankind, may be attributed rather to the imperfection of language than to any inferiority in the pure and natural action of the mind itself.

CHAPTER III.

CONSCIOUSNESS.

Consciousnses — Consciousness only during part of existence — During sleep—Perfect unconsciousness—Deep thought and partial consciousness—Dreams—Anxiety—Consciousness depends on physical state — Mechanism of consciousness—Origin of consciousness.

I HAVE traced the mechanism of the mind beginning with material objects in the external world, and then by examining the manner in which under the influence of certain physical forces an action is produced on the organs of sensation, and from them transmitted by the nerves to the brain where some change takes place, which ever afterwards has its influence on the mental processes.

This organisation appears to be purely physical, and to a certain degree intelligible on anatomical and physiological grounds; but how do we distinguish between a thought and a reality? How do we obtain our idea of consciousness? How, in fact, do we know that we are here at all? We do know it nevertheless. I have asked suddenly numerous individuals, from the child to the old man, How do you know you are here? The answer comes back 'I know it.' The answer is true, they do know it, but how?

All other operations of the mind can be traced to phy-

sical causes depending upon material organisation, but this one idea of personal consciousness baffles our understanding. No combination of physical elements can produce consciousness, and no complication of mechanism can afford the idea of consciousness.

None of us are conscious more than two-thirds of our entire time. During sleep we are all unconscious. In some states of the body consciousness is lost, as, for instance, during the coma of apoplexy, or during the continuance of an epileptic fit, when, although the heart beats, and the organs of sensation are perfect, and the nerves could carry the impressions to the brain, no effect is registered in that organ, and we are dead to the external world, and have, as it were, no existence, no self-knowledge.

In a state of the most perfect consciousness and fullest wakefulness the mind sometimes attends to two matters at one time. Sometimes even three operations of the brain occur simultaneously, besides many slighter matters which the mind apprehends, but takes but little notice of, such as the ticking of a watch, the passage of a figure before the eye, an odour affecting the nose, or a slight pain or twinge in any part of the body.

This duality or plurality of mental action or thought is a matter of habit. With me it is so constant that it is my custom to read or even to write upon one subject when my family are conversing upon another. Most of my published treatises have been written after having been thought out, when I have been talking with my family and friends upon the ordinary subjects which are discussed at a family gathering on a winter's evening.

At times the mind requires to isolate itself, as it were, from the external world, and concentrate thought upon the subject to be worked out. The ear must not hear nor the

eye see. This has been the case in the thought required for the development of this work. Many times I have been so thoroughly absorbed in developing the general scheme that, whilst walking the public streets I have found myself standing still to grasp, as it were, the relation of one part of the complicated details of the subject to another; and one day when it poured with rain I was amused on passing a friend to find that I had said, 'A fine day,' so entirely was my mind engrossed by the consideration of the matter before me.

There are times also when we are only partially conscious and not fully and thoroughly alive to all which is going on around us. When our minds are fully conscious our friends say that we give them our attention; but if we carefully examine ourselves it is surprising to find to how small an extent any of us are thoroughly attentive even when fully awake to every thing which is passing around.

During sleep we are in the same way frequently not so fully asleep as to be entirely dead to the external world and lost to our own thoughts so that between the most perfect wakefulness, the most concentrated thought, and the most profound sleep, there are innumerable varieties of degree wherein consciousness is more or less perfect.

Particularly under disturbances of the digestive organs fanciful images appear to our minds which eventually startle us from our sleep. When we awake we know that the ideas are but dreams, and our returning consciousness makes us aware that the pictures we have seen had no existence, and were but the fanciful creations of a disturbed mind, occurring probably from some error of diet and the concomitant irritation in the brain.

When the mind is distressed by anxiety the same subject appears again and again before us, the mind is unsettled

and sound sleep is prevented. We then do not become totally unconscious, and neither the mind nor the body are refreshed to that extent which the loss of consciousness in sleep provides. During this partial sleep it by no means follows that the dominant idea should continue to appear, for in this disturbance of the mind ideas may appear having no relation to those which have distressed us. Dreams caused by some simple bodily irritation may bring before the mind distressing pictures having no relation to any circumstances at the time surrounding us. The dream of a fall down a precipice, and of multitudes of other nightmares which we might name, are familiar and frequent examples.

The best remedy for sleeplessness from anxiety and the continual reappearance of painful ideas before our minds contrary to our desire, is the observation of the works of Nature. The study of natural objects exercises our bodies, employs the organs of sensation, exhausts our nervous system, and promotes the unconsciousness of sleep by which our bodily strength is rendered more capable of bearing up against any trouble which may oppress us.

Returning consciousness after disturbed sleep shows that the ideas then presented to the mind are but dreams, and our returning consciousness makes us believe that consciousness is strictly referable to physical mechanism, but consciousness still remains the great unsolved problem, as we cannot perceive its relations to the mechanism of our organisation.

Without physical organisation there is no consciousness. Without physical organisation in its healthy state there is no consciousness; so whilst we admit that the human mind cannot understand how a material organisation may produce, or be associated with, consciousness, so we are com-

pelled to declare that consciousness is not manifested without a material mechanism.

In all other respects our brain and nervous system are strictly analogous to a watch which shows us time, or to a machine which judges of the weight of coins, or to a steam-engine which exercises force; but no inorganic material mechanism is conscious of its existence, nor can any complexity of mechanism produce any result in any way similar to consciousness.

The nature of this self-knowledge has been unknown in all ages, is now unknown, and probably will ever remain unknown. How consciousness is affected by the material structure of the brain, and what relation there is between that structure and consciousness, is a matter which utterly baffles our understanding.

Every other thought or act of reasoning, or effect of mental power, is strictly referable to physical organic mechanism; but consciousness appears to be a power by which we view our structures from a point without ourselves, and yet we can only do so when the bodily structure is entire and evinces healthy action.

The particular mechanism on which consciousness depends appears to be that which gives a knowledge of what takes place within us. It is the mechanism of somaisthenics or of bodily sensations in contradistinction to cœnaisthenics, or sensations derived from external force.

Sleep is the rest of the brain and the cessation of consciousness. How the brain ceases to act during rest, how consciousness during sleep is suspended, are phenomena as recondite as consciousness itself.

Up to the present time from the study of external phenomena alone, we have no clue as to why matter generates

force, and likewise up to the present time we have no clue as to why organised creatures evince consciousness.

As it is the province of inorganic matter to evince force by an inherent property, is it not possible that organic beings may exhibit consciousness also as an inherent property? Inorganic matter can only evince the power of attraction from a capability conferred upon it in the beginning by a superior power extrinsic to matter, so may not consciousness be conferred upon organic beings by the same extrinsic power, the Creator of all things?

CHAPTER IV.

ON THE WILL AND LAWS OF HUMAN ACTION.

Human action—Automatic action—Voluntary action—Actions regulated by former ideas—Will not altogether voluntary—Laws of the will—The action of man regulated by pleasure and pain—Free-will and necessity.

After receiving an impression through the medium of the senses, and comparing it with all other similar events which have come before the mind at a previous time and with all the moral laws which we have learnt or developed for ourselves, action ensues.

The muscular action which is performed by the body is sometimes purely automatic, for when a sensor nerve is irritated, certain definite muscular movements are determined,—and really many of our muscular movements are of this character, and are not governed by mental action, that is to say, the particular muscular movements which are determined, are not regulated by mental action, but act automatically, without passing through the higher parts of the brain affected by all former knowledge there registered.

When a frog is deprived of a great part of the cerebral hemispheres it will continue to crawl up when balanced on the hand. This action involves a curious and complicated

combination of muscular movements, which still take place after the active part of the brain is destroyed, so that they cannot be regulated by such general powers of mind as are bestowed on the frog.

The actions which are governed by the mind are called voluntary, and are determined by two distinct causes. The one emanating from the external world; the second originating in the mind itself. Man is incited to action,—

1. By the immediate excitation of the nervous system, from an action originating in the external world which passes through the brain and is modified by all preceding experiences existing in the mind. This kind of action is rapid, and is regulated by the immediate impulse rather than by experience. It is called the impulse of the moment, and is frequently injudicious, because the mind has not had sufficient time fully to regulate the line of action.

2. By the occurrence of a thought spontaneously arising in the mind from images of actions registered in the brain, and regulated by all the impressions which have been before received, or by ideas which have been taught us since infancy.

3. By a spontaneity or desire for action arising within our organisation. This tendency to action exactly resembles the tension of a voltaic battery, and when sufficiently strong to cause action is regulated by all the ideas existing in the mind. This tendency to action, regulated by the mind, is the will. The will is an impulsion to action set in motion by the state of the nervous system, and there is no reason whatever to suppose that the will is something outside matter which sets in motion the body through the nervous system, as the parts of a puppet are moved by its wires.

It is plain to me, though we may flatter ourselves that our minds are perfectly self-willed, and that we always act as we please, that we really in every case, more or less, do act not only on the immediate impression of the external world, but on all the former experiences and moral laws existing in the mind. Our actions, regulated by our minds, run in a groove, as surely as the steam locomotive runs on the rails. To run out of a definite groove, a violent disturbance of the mind must occur,—just as much a disturbance as would be required to cause the engine to leave the rails.

The mind is governed by circumstances, the laws of the influence of which may be learnt by study and observation. The will is not a directing influence to act in any uncertain manner, but is the direction of the mode of action of which the entire mind is the regulator.

Example 1.—A man follows a suggested action when the action is itself attended with present pleasure, and is free from present pain; when experience of similar past actions proved them to be accompanied by pleasure and devoid of pain; when from all known events registered in the mind the action may be supposed to lead to future pleasure and be devoid of future pain, and according to the infinite law will insure infinite future pleasure and avoid infinite future pain.

Example 2.—A man avoids a suggested action when it immediately produces pain and leads to no pleasure, when similar antecedent actions caused pain and were not accompanied with pleasure. When the action may, from all known experience, lead to future pain without pleasure, and when the moral law points out that the action will involve infinite enduring pain and prevent infinite enduring pleasure.

To guide us to the knowledge how any individual man

will act under any question submitted to him, we ought to be informed of the ideas existing in his brain as to whether the action would be attended with present pleasure, present pain, past pleasure, past pain, infinite enduring pleasure, infinite enduring pain. Having this information we should know, with perfect certainty, his mode of action.

The case is very simple when we have simply an affirmation and negation of pleasure and pain in the present, past, future, and infinite; but sometimes the idea existing in the mind is unknown, and then our forecast of action is a question of greater or less probability, and a judgment of the extent of that probability can only be inferred by the number of times pleasure occurs in relation to pain, as may be deduced from the following table:—

Present.	Past.	Future.	Infinite.	
+	+	+	+	Decided action
0	+	+	+	Highly probable action
0	0	+	+	Probable action
0	0	0	+	„ „
—	+	+	+	„ „
—	—	+	+	„ „
—	—	—	+	„ „
0	0	0	0	Unknown
+	0	0	0	Probable action
+	+	0	0	„ „
+	+	+	0	„ „
+	0	0	—	Probable inaction
+	0	—	—	„ „
+	—	—	—	Highly probable inaction
—	—	—	—	No action

\+ Pleasure .. 0 Unknown .. — Pain

Perhaps it is fortunate that we have not so intimate a knowledge of the ideas existing in each other's mind, or we

might know the course of action likely to be adopted by each, as surely as we calculate a sum in arithmetic.

Different persons are affected in various degrees by these effects of pleasure and of pain. In some the immediate impression is more active in which case they are called impulsive. In some the fear of the future is more active when they are called timid. Again, all considerations have their due weight when they are called thoughtful; and, lastly, the consideration of the infinite governs the action of some who are called religious.

If pleasure and pain in the present, past, future, and infinite, really govern men's actions, how important is pain in the government of mankind. It has been asked why pain should have been allowed by a beneficent God; but, as man is created, it is a necessity for the protection of the creature. Pain helps to govern our action and protect our bodies from injury and death in this world.

Pleasure, however, has more influence in the government of mankind than pain. The hope of pleasure is greater than the fear of pain; but the utmost possible effect is produced on man by holding out the prospects of much pleasure, and, at the same time, holding out the fear of some pain.

On a study of the laws of human action we find that the child is born with a will which is unrestrained and free to act in any manner. An impulse stimulated from the external world and outside of the body, or from a desire originating from within the body itself, leads to action without regulation or restraint. The child at birth has free will, subject only to natural instincts implanted in his organisation. As soon, however, as the brain has received impressions from the external world, or from teachings of other persons, the will is no longer free, but is governed by necessity. The

conduct of the parent influences the child, experience regulates the will, so let us teach our children that they may be necessitated to do right, and that their wills may be restrained by the perfect moral law of God, so that pain may be avoided and pleasure promoted both in the present time and for all time to come.

CHAPTER V.

ON EDUCATION AND FACULTIES OF MAN AT DIFFERENT PERIODS OF LIFE.

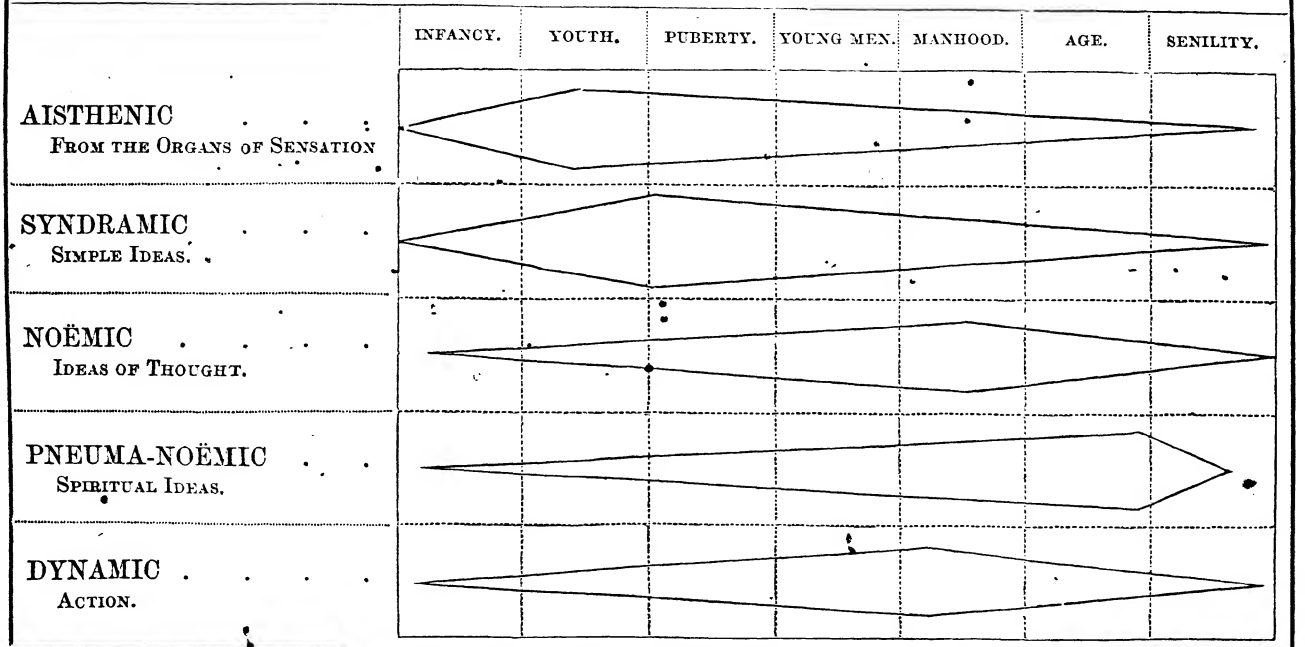
Faculties at different periods of life—Diagram—The mind in childhood —In youth —In Manhood—In Senility — Education through the organs of sensation—Education by written knowledge.

I HAVE already noticed that the mind of man exhibits five great faculties, which are exemplified to a different extent at the different stages of life. The child is distinguished by the quickness of apprehension through the medium of its senses, which decreases from early youth to extreme old age,—the boy for an aptitude for receiving ideas either from observation, or from communications received from other persons, a power which diminishes as years advance,—the man for thought and design, which led him to brilliant actions, though both these powers vanish in senility,—the old man for deriving his chief solace from the contemplation of the infinite, a property which diminishes at extreme age.

The accompanying diagram illustrates the powers of man at different ages. It shows how each faculty of the mind is developed, arrives at maturity, and passes away. It points out the relative extent of the powers which man possesses at each period of life. When I had finished my drawing I was delighted with it, as it placed the subject vividly before

Fig. 5*.—Page 34.

Faculties of the Human Mind at Different Periods of Life.



the mind. It speaks emphatically, more than volumes can teach, that at every period of life a different capability is conferred upon us. It cries out, trumpet-tongued, Lose not to-day, or to-morrow will suffer. This day will never return. The man cannot repair the omissions of the boy, nor age those of manhood. An untaught youth leads to an unskilful man, and unskilful manhood to imbecile age, when the eye can no more see, the intellect understand, nor the hands execute. The intellectual man passes away showing the outward form, but not the inward mental power.

To the teacher it indicates how education should be conducted. In childhood the eye should be taught both accurately to see and to distinguish what is seen; the ear to hear and know what is heard; the nose to smell, and to distinguish the character of the odours smelt; and the tongue to taste, and the quality of the savour tasted. Childhood is eminently the aisthenic age, when knowledge is obtained directly from the organs of sensation.

In early infancy the child obtains much knowledge of the external world, and remembers before it has any use of language. It knows, for example, a dog from a cat, an elephant from a horse, and one person from another. At a later period it can assign names to these external objects. It can by signs and gestures convey its desires to the mother or nurse, much in the same way as a pet animal does to its master, and it is only at a much later period it can use language to explain itself. In time, however, the brain becomes developed, and in a very rapid manner the child speaks by words and not by signs, and shows the more noble qualities of man.

In the period of youth, the knowledge of objects with the proper name to be assigned to each and the knowledge of simple facts is mostly acquired. The power of obser-

vation increases with its exercise. The youth taught to observe bestows his attention on everything around him, whilst the untaught passes heedlessly by the most interesting objects, and takes no notice of the most striking facts. In youth the observation and registration of facts should be carefully cultivated and practised.

Every fact may be regarded as an unit of knowledge, and those who acquire the largest number will have an advantage over those who possess less. In Germany, youths are taken as a recreation to the fields to be shown the flowers and plants, so that they may acquire botanical knowledge; to the hills, to have the rocks, and stones, and soils indicated to teach them some rudimentary knowledge of mineralogy and geology.

If England desires to rival Germany she must do as Germany does, by teaching her sons and daughters a knowledge of natural objects before they study the abstract sciences at our great universities. Accurate syndramic knowledge is a department of education which requires cultivation in England.

In manhood the higher powers of thought are exercised, and the faculties of the mind come into play. This is eminently the noëmic age, in which the powers of the mind are shown. Mental power must have facts upon which to rely, and according to the extent and the vividness with which the ideas have been implanted in their youth, so will be their power to lead to noble conceptions and designs.

It is by means of these conceptions and original designs that man is led to brilliant actions, which in the arts give rise to the great painter, sculptor, and architect; in literature, to distinguished authors and poets; in the army and navy, to heroes; and amongst professional men, to our brilliant philosophers, engineers, physicians, and lawyers.

The noëmic power is only potential in manhood, and vanishes in senility, when memory is defective, thought powerless, action impotent, and when the chief solace is a contemplation of the infinite.

During the period of education teachers should always seize upon the more active faculties of the mind, and work from them to those which are less developed. Much loss of time and impairment of intellectual power often result from teaching abstruse grammars and dead languages to children at a period of life when their minds desire to obtain knowledge by their organs of sensation. This course greatly weakens the powers of the mind in after-life, as the mind does not have a proper and vivid impression of objects and facts in the external world on which future reason must depend.

Personally, although I had the advantage of an education at that great seminary, St. Paul's School, which was founded by Dean Colet, and which ranked amongst its pupils Milton and Marlborough, yet my masters, whose kind friendship I ever retained, could not influence me to take advantage of their teaching, as my mind was thoroughly occupied from my early childhood with a love of the study of natural objects.

At that time that knowledge of nature and of natural laws had to be obtained under difficulties and disadvantages. Whatever came before me I seized with avidity, and it is lamentable to contemplate how many minds there must be throughout England who now yearn for the means of acquiring a knowledge of natural objects and of natural sciences who are yet compelled to devote their entire time to the acquisition of the dead languages.

From infancy to the present time I have ever remained the child. A new plant or a new animal delights me as

much now as it did then, though I have found it necessary to study the use of language, the laws of thought, and other abstract sciences.

Although some individuality appertains to every living being, as an instance of a variation between certain limits, yet the table of the faculties of the human mind at the different periods of life, may be taken as a fair average representation of the proportionate development of the powers of the human mind at the different epochs of life.

In the education of youth, and in the regulation of our minds in later life, it is desirable so to divide our attention that we may continuously obtain knowledge directly from the observation of nature, whilst at the same time we receive ideas through the medium of words, language, and pictorial representations.

Nothing refreshes the mind so much as the observation of natural objects. It gives a freshness to our thoughts, improves our knowledge, quiets our passions, and imparts wisdom to our understanding.

The people are happier and exhibit more mental power in proportion as they are afforded an opportunity of studying objects in nature, of viewing fine examples of art, and of reading the written knowledge contained in our choice literature. How far these opportunities may be afforded in the utmost extent to the multitude should ever in all countries be a source of anxious care to the governing authorities.

CHAPTER VI.

DISCIPLINE OF THE MIND.

The importance of using every organ—The practice of the use of the organs of sensation — Of memory — The practice of abstraction by thought, reflection, and comparison — The value of books in testing our personal knowledge — Value of conversation — Contemplation— Subjugation of our thoughts to moral laws—Benefits of Christianity— Evils of matter worship—Regulation of our actions.

As every complicated machine requires careful treatment, so the brain, the most intricate of all organised machines, demands at our hands the most careful discipline to enable it to perform its functions in the most perfect manner.

It appears to be a province, and perhaps we are justified in saying that it undoubtedly is a peculiarity of all organic structures to improve by use and to deteriorate by rest; hence it is necessary that the brain should be regularly exercised, and that the mind should be continually and judiciously employed. Firstly, with regard to the external world, all the organs of sensation should regularly be brought into use: the eye to see, the ear to hear, the nose to smell, and the tongue to taste. The extreme limits of the powers of the organs of sensation should be daily em-

ployed, for only thus can the utmost delicacy and sensitiveness of these organs by which we obtain a knowledge of the external world be secured.

The powers of the organs of sensation having been intensified and perfected, the images carried to the brain and there registered should be carefully and repeatedly examined to prove that each image is a true and correct representation of objects in the external world. When we regard a flower we should practise our mind to register an exact image of all the parts of that flower. When we inspect a picture we should register in the mind every feature of that picture, such as the objects depicted, their relation to each other, the colour of each part, and, in fact, every thing which the picture can represent to the mind, so that it may reappear hereafter in all its perfection of original detail. When we accurately examine the images existing in our own minds, we find how imperfect all our observations are, how much we might have recorded which we have omitted, and how much we might have seen, heard, felt, or tasted, which has passed before us unnoticed by our senses and unheeded by our mind.

In leisure moments images fixed in the brain should be recalled by an act of memory. This exercise of memory promotes the power to remember, and the image of the object itself registered is again more vividly implanted in the mind. Good photographs are a useful aid to the memory of that which has been seen by the eye, and it has been my custom to possess myself of the finest and most perfect photographs and representations of the most beautiful objects and lovely scenes which it has been my good fortune to observe, that I may recall to the mind the former scenes which have been witnessed, and thus enjoy the present by a memory of the past. Whilst we endeavour to

strengthen the impression of the beautiful, so we ought also to seek to efface the images of the ugly and bad, and as far as possible to throw them into a subordinate position that they may not recur to our mind to harass or annoy us. This discipline of our memory is unquestionably difficult, for the horrible will recur without great and constant care to suppress and lower its power; nevertheless, much may be done by constant vigilance and determination.

As the images of former objects and events reappear before the mind they should be carefully compared one with another. Those which have properties in common should be associated together; those which have properties unlike should be separated, that our knowledge may be arranged and thus rendered more easy of access for the purposes of thought and of future action.

Images and combinations of images registered in the brain and represented to the mind should by thought and reflection be compared with human knowledge derived from all sources, so that our own knowledge may be compared with that which has been obtained by other observers; by this means any discrepancies or errors of observation may be detected, and, as near as possible, the absolute truth upon any one subject may be obtained.

In making these comparisons, the attainment of truth and success entirely depends upon the value of the written knowledge of other persons with which the comparison is made. Good literature leads to truth and an admiration of good literature; bad literature leads to falsehood and a love for debased and degrading writings.

Besides consulting books and the written records of other observers, all philosophers agree that part of our time should be spent in the company of other men, that by conversation we may ascertain how the same facts and images appear to

different minds, each having a separate experience. Social communications with the good, the great, and the learned, are powerful adjuncts to accurate thought. The resultant of the thoughts of two or more minds is generally more accurate, and more powerful than the single thoughts of one man; and when the same opinion appears separately to the minds of two or more persons upon a deliberation of facts on the same subject, independently observed, then is the conclusion as true as can be obtained with the state of our knowledge, and experience shows that such judgment deserves the gravest attention.

As we pass from the deliberation of more simple subjects to higher and more profound generalizations, a more intense mental effort is required. Deep thought and profound meditation is best practised immediately after sleep, and especially before we rise from our beds in the early morning. Even during sleep itself we appear, if not in profound sleep, to exercise our minds. I have never found thoughts during even light sleep of any use. The images on the brain overlap, and whilst I have tried to catch on many occasions a thought, I have never found it of practical value, as it always on close examination presented some deficiency or infirmity, and I have rarely had a trustworthy statement that the experience of others is different.

Contemplation is undoubtedly favourably exercised amidst the works of nature whilst the body is in a state of repose, especially if the state of atmosphere is genial, and the scene around joyful, so that the mind is serene, and the bodily feelings comfortable. Contemplation amidst the works of nature should be kept well under subjection, or the works themselves may pass unheeded. A friend has told me that when amongst the works of nature beautiful passages from the poets appear before his mind, and as a consequence

many phenomena are lost to him whilst contemplating the observations of others.

A dead silence and perfect stillness is not always favourable to deep study, as the mind is then liable to be startled by the slightest noise. On the contrary, a slight general excitation of the nervous system, to which practically no attention is given, is more favourable to thought and deliberation. A prosy, dreary sermon, monotonously delivered, particularly stimulates thought in my own mind, to the utter neglect of the discourse itself; and as a singular instance of excitement of thought, I may record that this chapter was designed and thought out whilst hearing a pleasing light operetta at Paris. The memory of the songs and scenes of the operetta, which delighted me at the time, was totally lost, though this chapter was so deeply and powerfully impressed in my mind, that only the mechanical labour of writing was required to produce it two or three weeks afterwards. Not only ought we to rely upon thought and comparison to decide specific cases which come under our judgment, but by contemplation and the subjugation of our thoughts to infinite right and wrong, to infinite good and evil, we should so construct general laws, and have them ever before our minds, that we are ready at any moment to instantly adjudicate upon any question submitted to our judgment. By this plan alone can we obtain determination of character, and promptness of decision, and it is in this manner that religion, rightly used, has such important influence in producing constancy and fortitude.

Christians not only regulate their thoughts on these higher considerations of right and wrong, but profess also to conduct their lives after the model of Jesus Christ, whom they recognise as the perfect man with whom to compare their own imperfect natures. Christians study the life of

Jesus Christ as detailed by the Evangelists and seek so to regulate their own lives that they may in some degree partake of His glorious perfection. The experience of nearly 2000 years shows the importance of Christianity to the world. By comparison the Christian standard of human action is infinitely more perfect than that laid down by any other person since the beginning of the world, and consequently is the best test for comparison. Christians may now rely upon the universal experience of mankind, and their minds accordingly would be affected by doctrine and experience.

Those who associate the infinite God with Jesus Christ, are more powerfully affected from their religious belief, by the ideas existing in the mind, but the moment the infinitely perfect man is recognised, in all his actions, which are in obedience to the laws of God, the effect on human thought is similar.

Great as is the power of any perfect religion for good, great is equally the power of any materialistic religion for evil, and the experience of the world has shown the evil and degrading character of matter worship in any form, and how far the mind should be disciplined against its use.

When a man by thought and deliberation has come to a conclusion after meditating on all the circumstances of the case he has a definite object to seek. When he prays that that object may be accomplished there is a high probability that he will obtain it. For prayer to be effectual it should be made when every other thought of the mind other than the object solicited is absent, and when there is the fullest belief in the desirability of the end sought for.

The mind having determined, after thought, upon a mode of action the act itself requires care and circumspection in its performance. It must be suited in time to the nature of surrounding circumstances, and its degree of energy must

be commensurate with the resistance offered. No more strength should be exerted than what is necessary. No more hurry than what is required. Calmness and gentleness should temper rashness and furiousness to obtain without passion the object which is desired.

The different powers of mind should be subordinate one to another. Each should have its proper influence, none should be in the ascendancy, for if there be any variation in the relative position of any of the faculties of man, difficulties may arise. Every part of the mind should be brought into its regular exercise that each may attain an equal strength and none attain to an ascendancy to the detriment of the rest. When any man uses any part of his mind to the neglect of any other part, the whole degenerates, and there is no longer that perfection of which the human mind is capable. When a man only exercises his organs of sensation he becomes sensual, and delights entirely in eating, drinking, and in the exercise of animal appetites and instincts. When his mind rests solely upon simple ideas he is a matter-of-fact man, without originality or thought, a bore to himself and everybody around him. When his mind is solely dedicated to musing upon his own ideas, he is dreamy and non-realistic; but when every part of the brain is maintained in perfect efficiency of action, then does the human mind show its great and glorious perfection.

CHAPTER VII.

ON THE ORIGIN OF THE HUMAN MIND.

Mind of man superior to that of other animals—Evolution—Hypothesis of the kinds of matter—Hypothesis of evolution of mind—Development from infancy to manhood—Can matter produce organic beings, and organic beings man?—Experience of evolution—Limits of variation in organic beings—Tendency of varieties to resume their original type—Spirit—The soul—Specific creatures and evolutions.

We have hitherto observed that the human mind originates in that physical structure of the human body called the brain. This organ in man is not heavier, relatively, to the weight of the entire body than the brain of some inferior beings is to their bodies, but, on the contrary, inferior creatures have in some instances a brain of higher relative weight than that of man; nevertheless, the mind of man is incomparably superior to that of any other living creature. Some animals have the power of emitting light, others of electricity; but not one can use artificial light, electricity, or any other material force, nor can any one use words and language in the manner in which we use them, either to record their observations or reason by them, although they may use the song of joy or cry of distress. No animal but man has the power of abstraction or of using abstract ideas.

The first question which perplexes the minds of men at

the present time, is whether the superiority of the minds of men has been the result of a slow progressively higher development from that of the lower animals, or whether man has existed as man from the earliest period, and was specifically created to manifest his superior faculties at the time he first appeared at the earth's surface.

The doctrine of gradual development or evolution of the higher animals from the lower has received a great accession of support of late years from the labours of the great naturalist, Darwin, who has adopted some of the views of his distinguished ancestor, Dr. Darwin, of Derby, a powerful writer in the last century. Many learned men now adopt his hypothesis. Most of the rising young men of the universities accept it, though many of our natural historians, and of those who watch the habits of animals, entertain grave doubts on the question.

My mind does not for one moment assent to the proposition, that the very complicated contrivances which exist in the works of nature are the result of spontaneous or accidental selection. Such a doctrine is really a caricature of reason, and widely differs from a development or evolution upon preordained and fixed laws.

Nevertheless, there appear to be some persons who imagine, that every conceivable form of organic being is produced by chance, or a fortuitous concurrence of atoms; and of these all which are not suitable for surrounding circumstances perish, and only those which are suitable for the circumstances live.

When we regard the intricate complexity of many parts of organic beings, to say nothing of the requisite relation of one organic being to another, as for instance an insect to a flower, it requires a much stronger exercise of faith than such persons they themselves would like to admit, when they adopt

a theory of chance where infinite contrivance and wisdom so abundantly abounds.

In my 'Sources of Physical Science,' I have myself speculated that there is but one kind of matter composed of atomic particles, and that the various kinds of so-called elements are but different members of these particles aggregated together, so that they cannot again be separated. I further have ventured to suppose that these particles, when attracted together, constitute all the objects in the universe, and that the action of a new attraction on particles of matter before attracted together gives rise to all the phenomena of physical forces. The latter part of this hypothesis is capable in my judgment of full demonstration, to which I must refer in my lecture on the 'Monogenesis of Physical Forces;' but the former portion as to the nature of the elements of which all things are composed, is purely theoretical, as it has not been proved that any element can be separated analytically into other component parts, nor put together synthetically from any other elements.

The extreme extent to which the hypothesis of Darwin might be carried, is to suppose that an organic being might have sprung from matter under the influence of physical forces, without any direct or specific act of creation by a power external to matter. If this organic being has been produced at any time spontaneously from matter acted upon by material forces, there would be no reason to deny that some such primitive beings might not now be in the act of production, and that new organic beings were now being formed. After an organic being appears it multiplies and gives rise to other organic beings. These successors of the primitive organic being present slight variations, such as is seen between the likenesses of any two men or of any two animals. It is further supposed that these variations occur

in various directions, and each varied type or separate branch does, over a series of hundreds of thousands of millions of years, continue to vary, and by a series of minute changes produce different genera and species; so that all the plants and creatures now existing on the face of the globe, are said to have thus sprung from matter acted upon by other matter. They thus assume that no specific creation has occurred to construct man with his intellect, or the animal which walks the ground, the bird which flies in the air, the fish which swims in the water, the worm which burrows in the ground, or any other of the innumerable creatures which dwell on the earth.

Philosophers who hold these views point to the analogy of evolution in the development of plants from spores and seeds, and of the growth of animals from ova, when member after member unfolds itself from apparently inert matter. To fully appreciate this wondrous unfolding of the members, break an egg every day from the commencement of the sitting of a bird. On the third day the marvellous heart with its vascular area appears, from which time day by day some part is evolved till the twenty-first day, when out comes the perfect chick, capable of running upon the earth and finding food for itself.

Following these observations of the evolution of animals from ova, and of the stately tree from the minutest seed, we observe that the mind of man is developed step by step and day by day, from the infant which at birth scarce presents any trace of mental power till the man in whom the full intellectual qualities are exemplified.

As a further corroboration of the argument, it is noticed in the examination of geological strata, that different kinds of animals, mostly now extinct, are found at different periods of the world's history adapted to their special surrounding

circumstances; and hence it is argued that animals arise adapted to any condition of the earth's surface. If particles of matter could aggregate under any definite circumstances into a mass, which by a series of minute changes, extending over boundless epochs of time, could give rise by the influence of natural physical forces to the intricate and wonderful structures which we observe in plants and animals, and more particularly in the brain and nervous system of man, then we must concede that matter in the beginning must have been endowed by a power outside matter, with qualities and properties higher than those which hitherto had been assigned to it, the more especially as every particle of inorganic matter is at one time either in the solid, fluid, or gaseous state, whilst an organic being invariably is and can only exist in a partly solid and partly fluid state.

We must all admit the boundless power of God, as exemplified in the wonderful works of nature. We cannot, therefore, limit that power to a requisition that each existing thing should be particularly created by His Almighty Hand; and we must admit that a Creator of infinite power might at the beginning have so endowed matter, that it should evolve life under any circumstance which might arise at any future time.

The goodness, the greatness, and the omnipotence of God are as much shown whether He specifically created each organic creature, or whether He ordained at the beginning that each creature should be evolved as it was required on the earth's surface. Great, therefore, is the blame to him who seeks to establish infidelity on the doctrine of evolution, and equally great is the blame to him who charges infidelity on its belief, for all things are possible with God.

When we regard our own personal experience on the

doctrine of evolution, we find that the spontaneous appearance of even the lowest plant has never been clearly proved, but on the contrary, the most careful experiments have ever taught us not to accept the fact. It is true that some years ago acari were reported to have been generated on the electrolysis of matter, and we had presented to public notice the acarus of Cross (fig. 6), and the acarus of Weeks (fig. 7). I have no hesitation in stating that to my

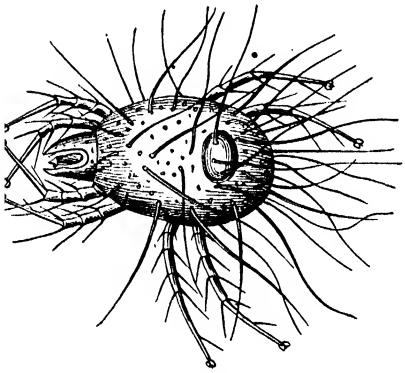


Fig. 6.

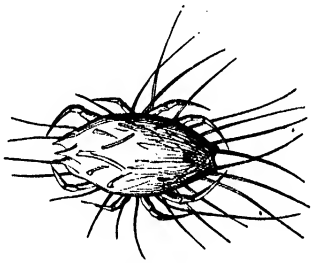


Fig. 7.

mind, according to my experience of electrolysis, which has been enormous, there was an error of observations and that these creatures were not formed under the circumstances stated. The argument of evolution derives no support from the recorded changes during the longest period which history unfolds. The most ancient delineations of man and of animals depict them as they now exist, but it is fair to mention that the evolutionists consider this an argument for the necessity of minute changes to occur over series of hundreds of thousands of years.

Although every man and every individual organic being differs in some slight degree from every other man and from every other organic being, the difference appears always to

be restricted within certain limits of variation, and every breeder of cattle knows that this difference has a tendency to be lost, and that the deviating individual or successor has a tendency to revert to its original type. No practical man doubts that if our breeds of animals, which have been artificially selected with great care by the intelligence of man to suit some special want, were left to themselves, all would revert to the original typical form, and that the distinctive character would in a short time be utterly lost. In fact it requires unremitting care to maintain any deviation from the typical form.

Our minds clearly perceive that all men are developed in a manner similar to the fowl from the egg, each member being formed by a continual progressive change to perfection; and the brain, which is the material mechanism of the mind, is developed before the phenomena of the mind itself can be exemplified.

There is no evidence whatever that there is anything beyond that mechanism which exists within us or about us to regulate our mental action or direct the brain how to work the muscles of the body; nevertheless many good persons suppose that there is a something besides that organic structure which is independent of it, and they believe that something to be a spirit.

Some believe that this spirit has the power of leaving the body of one person and of communing with the spirits of others who are living, or even with the spirits of those who have lived at a former time.

Such opinions appear to be utterly unfounded in fact, and the supposed circumstances are doubtless acts of memory occurring in persons in a state of not thorough consciousness, when the image of the second person and of his former sayings appear in combination with ideas already existing.

The idea which the mind entertains of a soul is that of a personal individuality which we are forced to believe has an infinite existence. This idea of an infinite enduring personal identity which is ever before the mind is utterly incapable of demonstration as a fact either by experiment or experience.

To those who refuse to admit that a personal identity can endure for ever, I have ever found that comfort could be afforded by demonstrating to them that no intuitive idea has ever been implanted in vain. The bee builds its comb upon a plan which never fails. The hen sits upon her nest and the chick comes forth from the egg. The child drinks and its thirst is quenched, and so we may trust with safety in the idea implanted within us, that our mind in its personal identity will endure for ever.

Unquestionably with our present knowledge the doctrine of specific creations presents less difficulties to the mind than the evolution of the brain and mind of men from matter itself. Either theory equally points to the infinite power and wisdom of God, and we may say of both with the Psalmist who sung thousands of years ago upon the development of the members one by one, 'which day by day were fashioned, when as yet there was none of them,' that 'Such knowledge is too wonderful and excellent for me; I cannot attain unto it.'

CHAPTER VIII.

ON THE GOVERNMENT OF MANKIND.

Pleasure and pain regulate action — Influence of one person on another —Influence by personal statements, by anonymous writings—Value of repetition of statements—Imperfection of arguments—Self-taught persons not liable to influence—Modes of influencing the minds of others—Sympathy—Government of criminal classes—Punishment of criminals—Regulation of our own minds to withstand the influence of others.

THE mind is influenced by the immediate impressions it receives from the external world. It is also guided by the experience of the past, and also by the general principles and moral laws which have been communicated to the brain. It is as a resultant from all these considerations that man is guided to action: he seeks pleasure and avoids pain.

In practice, very complex cases are presented for consideration. As a consequence of any particular line of action, we may receive pain at the present time and expect a continuance of pain in the future. Thus, if we expose our finger to excessive heat, the present sense of burning would be highly painful, and ever afterwards we should be deprived of the use of the finger. By another action we may incur immediate pain, but receive therefrom future

advantage and pleasure: for example, it is a painful act to have a foreign body taken from the eye, though that would be attended with future pleasure by preventing damage to the eye and by preserving the sight, and who would not willingly suffer the one for the sake of the other. Again, by other actions we may receive immediate pleasure, but incur the certainty of future pain. All men who drink to excess derive, what they conceive to be pleasure at the moment, though drink lays the seeds of disease for the future, and thereby causes pain."

By every possible manner that pleasure and pain can be associated, any definite act of life may be determined. When one person desires to affect the mind of another, it is necessary for him to consider what are the ideas which the person to be affected already possesses. The experiences of one man are not those of a second, therefore, that which will influence one person will not affect another. Whilst it is necessary to study the ideas already existing in the mind of a person to be affected, so it should be a matter of care with all not so far to expose any weaknesses which they may have detected in their own minds, so that they themselves may be rendered liable to be improperly acted upon by designing persons.

If once all the ideas existing in the mind of any person be accurately ascertained, then his mode of action under any definite circumstances can be predicated as certainly as though his brain were a watch or other piece of mechanical mechanism, for very few persons indeed deviate from an habitual course of action. A sudden impulse is always dangerous, because it is liable to control the actions of any man. An immediate prospect of benefit, which in philosophical language may be interpreted to be, the probability of immediate pleasure, is apt to captivate the

mind, and cause it to neglect other experiences. This may be a source of danger to those who are to be influenced, but it is a source of strength to those who seek to influence the actions of other persons.

A sudden attack on the mind is but transitory in its effects, and to be powerful must be followed by immediate action; for if once the new idea is received, it is commingled with the ideas which have before been implanted in the brain, and possesses no more special power than any former idea. It simply takes its proper place amongst all the notions which a man has at any time obtained.

Reflection dispels the illusion of its particular importance, thought compares it with all former ideas, and its true value is rightly appreciated.

To avoid the effects of a sudden impulse, time should, in all cases, be taken for decision. The action of to-day may be from impulse, that of to-morrow, after reflection, from pure reason, when the new idea will be associated with every other idea existing in the mind, and a determination of the course of action will be regulated by a consideration of the whole case.

A good rule which is very commonly practised, is not to come to any important decision without having slept upon the facts which have been presented to the mind in order that each may have its legitimate value. The mind on the return of consciousness after sleep is refreshed, and is then in the best condition to solve satisfactorily complicated problems submitted for its decision.

When it is desired to affect mankind, it is important that vivid impressions should be brought before the mind, and especially that these impressions should be derived from examples in the external world which are observed by the person himself through his organs of sensation.

What men see they are prone to believe, nevertheless, they often see what does not occur, or do not see all which has occurred, therefore a very grave discretion must be used in judging of the truth of that which is seen.

A well-observed fact has a most important influence for good, a badly-observed fact an equally important influence for evil. To affect mankind, therefore, any fact which men see for themselves has most influence, but the person to be influenced must well judge of the value of the observed fact.

An appeal to the higher powers of reason does not affect many men very powerfully. The dogmatic or self-willed man is usually rendered more stubborn by any argument against his particular notions, and even with highly educated persons reason is of but little avail to change their views, as it frequently happens that the facts and arguments employed do not accord with the experiences and the reasonings of the person sought to be influenced, and the whole train of argument is discarded as fallacious. To affect any person by reason, the premises should be thoroughly appreciated and admitted by him, for when two persons have exactly the same antecedent ideas they come to the same conclusions; hence little is practically done to influence mankind by reasoning processes apart from the facts upon which the reason is founded.

There is generally less to fear that the human mind will not reason rightly from the facts presented to it than that the facts should have been wrongly appreciated either from erroneous interpretation of what the senses have apprehended, or from a distortion from their being communicated by other persons. Clergymen frequently do mischief in the pulpit to the cause which they advocate by injudicious reasoning, without properly estimating the character of the ideas existing

in the minds of their hearers. A discordance is detected between the facts, which are true according to the experience of his hearer, and the reasoning of the pastor. By this unskilful mode of proceeding perhaps more infidels are made by teachers, although earnest and well meaning, than by any arguments or writings of the professed sceptic. Every argument used which does not accord with the balance of the experience of any of a preacher's congregation, is calculated to have an effect contrary to that which is intended.

The majority of educated persons are strongly governed by a sense of right and wrong and a desire to act conscientiously. Not many of any class of society willingly violate their conscientious belief of what is right unless they are strongly led to a particular course of action by some violent impulse. So strong is this desire to act rightly and especially so sensitive are men to appear to act rightly, before their fellows that wrong is often done. This is one of the chief methods by which a right-minded man may be led to do wrong. There is no more forcible method of acting upon a man than to suggest that his proposed course of action does not look right before the world. This idea has to be controlled by every strength of mind, as there are times and circumstances when the truly conscientious man to do right must appear to do wrong before many persons.

It is often stated that the courts of chancery in their anxiety to appear to do what is strictly equitable really promote fraud. The judges feeling that their function is to regulate right become so sensitive of implied falsity that when fraud is charged they incautiously decide wrongly to appear right before the world.

When we desire to affect the public mind by our writings, we shall first consider what the minds of our readers will probably, having relation to their existing thoughts, appreciate.

We shall then select some prominent and strongly marked idea to serve as the basis of our arguments. We then shall endeavour to work from acknowledged and admitted knowledge to that which is unknown or disputed, that the minds of our readers may be led by gradual stages.

When we write upon any subject upon which the public think we are entitled to speak, assertions have the force of our personal belief and statement under the signature of our names. This is the most satisfactory of all writing, and carries the greatest weight with the public.

In cases, however, where we think it desirable to affect the public upon matters in which the public would not consider that our own personal statement would give weight and authority to the fact, we have to rely upon printed documents, and trust to their internal evidence of truth. By this plan the question in debate is presented to our readers from a variety of aspects, and unquestionably some advantage is gained from ignorance of the source from whence the doctrines have been propounded. In a campaign to affect the public opinion of educated men, it is necessary to commence with the more unimportant facts and conclusions, and tentatively to watch their effect on the mind. The moment that it is found that one fact or one line of argument strikes home to the convictions of our readers, a point is attained from which success may be gained. The potent argument must be repeated over and over again, in fact, hammered into the minds of the public with such variations and new arguments as whilst they afford the appearance of novelty, shall only enforce the desired notion.

Until some defined idea is received by the public all labour is in vain, but directly a single point is effective, victory is certain.

In our relations with persons of the highest education,

whose minds are not only influenced by their individual experience, but also by all which they have heard or been taught, the use of short documents, tending to lead to the desired conclusion repeated at intervals is most effective, because the substance of the first is thoroughly registered in the memory before the second is read. When the second is received it is in accordance with the first. The third with the second. The fourth with the third. Every one repetition of an assertion adds to the weight of any former assertion (if it has been received by the mind, but not otherwise), till the conclusion is determined, and the mind is led to action in the manner desired.

Whilst I have sought to influence the minds of other persons on many points which I have thought right, so I have ever tried to protect my own mind from any improper attack from other persons. In every first attack it is important to carefully weigh the premises, for if erroneous, every future argument built upon them intensifies the error and renders the mind more easily influenced.

Experience shows that it is more difficult to influence the man who has derived his knowledge for himself from the external world. In fact, in practice, it is almost impossible upon any matter with which he is personally conversant to influence his opinion unless some new truth be brought before his mind in such a manner that he must admit it.

People who obtain their knowledge from hearsay are uncertain in their convictions and mode of action. They are apt to go one way at one time, another at a second, and are more easily influenced for good or for evil than the man who has fortified his mind by the study of natural objects and of natural laws, and who by this preserves a freshness and vigour of mind which is ever a preservative against wrong and a confirmation of right.

When circumstances are referred to me for a professional opinion, I have ever found that care must be taken in every written certificate to use every word in a sense which shall convey to the authorities to receive it an exact idea of the facts of the case, accompanied with a statement of the surrounding circumstances calculated to affect the judgment, so that the minds of my employers may be led to conclusions which the facts of the case ought rightly to suggest.

The government of mankind by which the community as a whole, or particular men, are led to act in a defined manner, is not a matter of chance, but should be conducted on fixed principles; for the mind of man may be guided to actions by laws, as sure as those by which heavy bodies fall to the earth, or light substances rise in water.

The leading methods by which a man may be guided to act are but few in number, and for convenience may be tabulated under certain heads.

The action of a man may be regulated:

1. By communicating a new idea which shall be an addition or a variation of those already existing in the mind. *Exam.*—A man would act differently when he knew that metals could be worked by electro-metallurgy besides by the ordinary methods by fire.

2. By giving immediate pleasure for one action, and pain for another. *Exam.*—When two glasses are presented to a man, one containing nitric acid, the other water. If the water be drunk, it would cause immediate pleasure by quenching the thirst; if the nitric acid, pain would arise from the destruction of the parts of the mouth, throat, and stomach.

3. By the promise of future pleasure, the threat of future pain. *Exam.*—A servant is told that by doing his work he shall have a dwelling, food, firing, and wages; but

if he will be idle he will be houseless, he will be starved, cold, and have no pay.

4. By the promise of infinite pleasure in heaven, or the threat of infinite pain in hell, according to the ideas held. The Athanasian creed is an example of a promise and a threat of this character.

5. By physical restraint; a man is compelled to act in a defined manner. *Exam.*—The policeman daily regulates traffic, and compels men to follow a certain course; and the prisoner is locked up so that he cannot practise his evil designs.

The principles to be followed for the regulation of the human mind are plain enough, but in practice they are difficult to apply, because it has been wisely ordained by Providence that the human mind shall preserve its individuality, and not be subject to an undue extent to the influence of other persons.

Perhaps the great key for the application of the laws of government is sympathy. Rejoice when they rejoice, weep when they weep, enter into feeling with every feeling, whether of hope or fear, of pleasure or pain, and by degrees over a long time one mind may obtain such a knowledge and hold over another as to guide its actions.

The high and strong-minded man holds off from too intimate association with his fellows, conceals the pleasures he receives, and does not descant of the pain he suffers. He keeps every other mind at a respectful distance. He does not too freely communicate his ideas, and does not allow any other mind to approach his too closely.

Men frequently meet every day for years without having an intimate mental communion. Married persons will live together all their lives without thoroughly communicating their inner thoughts to each other. They have a certain

influence over each other, the stronger to a certain extent ruling the weaker, but only to a moderate degree; but there is nothing more charming in this world than to have a friend to whom a man can fairly disclose his sorrows and talk of his joys, and who will confirm or declaim against any course of action where from its difficulty or complexity a doubt may exist as to its propriety.

On the other hand, it is not unfrequent that an uneducated servant will watch every act and thought of his master to such an extent as thoroughly to know his inner disposition; and by a judicious exercise of a little persuasion at any one time, as to be unobserved, and by a thorough sympathy with every thought, and participation with every sorrow or joy, be enabled virtually to govern his actions, as almost to reduce his mind to the action of a mere machine.

It is fortunate for mankind that no man can control the actions of his fellows unless he entirely devotes himself to that object. Young men of immense wealth are sometimes attempted to be acted upon by designing men; but it is noticed that before any person can approach the minds of other persons, to govern them, as either to modify their religion or take hold of their property, they must pander to their passions, assist their desires, and sympathise with their lowest vices.

The government of the criminal classes is difficult, for their minds are chiefly actuated by immediate impulses; religion, and the sense of right and wrong, influence them but little. To reason against the impropriety of their conduct is useless, as the theory of their action is comprised in getting the most advantage with the least inconvenience, irrespective of any other consideration.

No thief would rob if the robbery was certain to be attended with greater inconvenience than the benefit which

arises from obtaining the plunder which is taken. In practice, the criminal obtains an immediate advantage, by possessing himself of the goods of other people. He robs over and over again with impunity, with only so small a probability of conviction, and consequent inconvenience by reason of punishment, that it seems to his mind a bare possibility; in fact, he regards punishment for his crime as an accident to be deplored, but like any other injury which may happen incidentally to mankind, beyond his control. To be punished for robbery is to his mind like being injured in a railway accident, or run over in the streets, an event which may happen to any man.

A certainty of conviction for every offence committed, with its proportionate pain and punishment, is the true method to be adopted to restrain the criminal. As no man thrusts his hand into the fire, simply because he knows the pain which would arise from the burn, so no thief would rob if he knew the pain he would sustain by punishment would certainly outweigh any advantage he obtained from the theft. If a thief can rob a hundred times with impunity before, on an average of other thieves, one conviction is obtained, then his mind, as a matter of numerical relation, sums up the advantage to be on the side of the robbery. For this reason a man who constantly robs should, as an example to other ill-doers, have such a punishment as shall cause inconvenience enough to outbalance the advantage of all his previous robberies.

Our present system is as useless as it is unphilosophical, as the professed thief goes to prison to come out and repeat his career as before.

When the criminal inflicts personal pain to help him to obtain the goods of his victim, the certainty of as much personal pain to himself acts as a deterrent. The law for the

flogging of garotters, which was produced by the publication of an anonymous pamphlet was immediately attended with an important diminution of the offence. As the punishment can only be inflicted a considerable time after the offence, the immediate deterrent influence upon the mind of the criminal must be sought in the future pain to himself being far greater than the immediate pleasure or benefit he is likely to derive in committing the act.

Very heavy punishment, however, creates so much fear in the mind of the criminal, that he will do any act to protect himself. Murder has frequently been committed, not from any desire or wish to destroy the victim, but simply as a protection against the punishment of a murderer for other crimes. The thief reasons, 'Dead men tell no tales, if I kill the witness unseen I shall escape pain;' and hence a large number of murders are committed, not from any desire of destroying life, but simply as a supposed protection to the robber against his conviction for other offences.

In accidental injuries, Lord Campbell's Act has had a similar influence, for where an accidental injury has happened, the aggressor runs away and does not preserve life, not from any unconcern on his part, but to escape the consequences of his unintentional negligence, which may ruin his position in life from the civil liabilities which are entailed. In the lamentable disaster of an emigrant vessel off Dungeness, where the vessel was struck by another accidentally, three hundred lives were lost. Probably every soul might have been saved had the vessel which caused the collision stood by and saved the sufferers. The men on the steamer which caused the injury were frightened at the pecuniary liability which they had incurred, and steamed away, hoping that in the darkness of the night, and in the

confusion of the scene, the identity of the vessel would be lost, and that they might escape.

The power to act upon criminals by religious influences appears to be slight; we cannot readily render it available to control their actions. Having lived and practised for a long time a certain criminal course, their minds have become insensible of the impression of the higher powers of mind to restrain their criminal acts. Their minds are firmly imbued with the idea of immediate pleasure and gain from their thefts. They have too often enjoyed the produce of their theft without punishment or pain to be restrained by the consideration of any future pain as a result of their wrong-doing. The memory of this experience negatives the effect of any religious teaching which may be supplied to them.

In the punishment of criminals with the view to their cure, the idea of pain must be associated with every distinct criminal act, till experience shall warn them in common language that 'honesty is the best policy.' The longer has been the criminal career the more certain and more powerful should be the pain or inconvenience to himself which should accompany the crime, so that the mind may be influenced to restrain the act for the future.

In the extreme punishment of the worst criminals, the hope of future pleasure should never be withdrawn, for if once they hold the notion that they are submitted to permanent and hopeless pain, there is nothing left by which their actions may be controlled. The moral law is absent. They have no present pleasure, no hope of future pleasure, and they give themselves up to insensate brutality. To restrain their actions the promise of some pleasure in the future must be held out, when according as their mind appreciates the importance of the idea their conduct may be reasonably expected to be influenced.

The case is very different when a good man is subjected wrongfully to the punishment justly bestowed on the evil criminal. The hope of the future infinite pleasure in time and degree is ever a comfort to his mind. The idea of having done right is a satisfaction to him, and he submits to his persecution with resignation, trusting to an infinite power to protect him.

Experience shows that the hope of pleasure is as powerful to regulate the action of the human mind as the fear of pain, nevertheless, the most powerful influence is obtained by the promise of pleasure for any defined line of action accompanied by the threat of pain if any other course is followed. In using arguments for the pursuit of any line of conduct, it is commonly noticed that both the ideas of hope and fear must be excited.

Although in considering the influences on the nervous system, we ultimately resolve all sensations into those which are pleasurable and those which are painful, yet in common language the idea of pleasure includes that of convenience, advantage, or gain, and that of pain, inconvenience, disadvantage, and loss.

As the government of mankind is chiefly successfully conducted by regulating the nature of the ideas existing in every individual of the community, it demonstrates how the whole population should care for the mental culture of each, as it is far more practicable to confer right ideas in early life than to counteract evil ones at a later period.

Every man who seeks to govern should so fortify his own mind that he is not himself improperly governed, and the resistance to improper impressions should at all times be equal to the strength of the attack to which the mind is exposed.

It would be as practicable to have a case-book to record

modes in which the human mind is liable to be acted upon as it is usual for the medical man to have his case-book to record the manner in which experience demonstrates that the various parts of the body are affected by various medicines. Persons employed for specific purposes use over and over again similar reasons for different individuals. If a particular line of argument has proved successful towards one individual it is highly probable that it will be equally potent on another person under similar circumstances, and therefore we should ever remember that whilst we seek to regulate the actions of the minds of others, our own minds may in like manner be acted upon to our own benefit

CHAPTER IX.

ON WORDS AND LANGUAGE.

On Words and Language—Substantives—Adjectives—Verbs—Resolution of a verb or sentence as it was received by the brain—Induction by words—Deduction by words—Laws of thought by words—Relational and differential machine—Relational and differential slate—Human and Divine laws—Value of the pronoun I—On evidence and testimony—On quibbling by words.

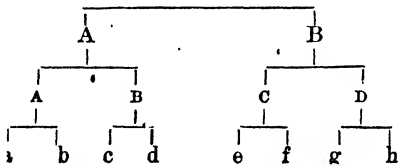
In the preceding chapters I have stated that external objects act upon the organs of sensation; that action is transmitted to the sensorium; and is probably registered in a certain combination of nervous elements, to appear again on subsequent occasions, constituting an act of memory.

For the purpose of communicating ideas from one person to another, or of recording them for the purpose of bringing the event again before the mind, we have recourse to various signs, sounds, or symbols, which is an artificial system which represents various images impressed on the brain.

But from the amazing number of images which may be impressed upon the brain, the use of words becomes a complex phenomenon, because it would be impossible for us to assign a different word to every single image formed in our organization.

The first class of words which we employ comprises those which are termed substantives, and which, if carefully studied will be found to include or embrace a large range of objects under one term; thus, when we speak of a man, we speak of an object which may give rise to a vast amount of images, as it comprehends white, red, and black men, good and bad men, men in health and sickness, &c.

I showed that all our mental images were made up of actions on a certain aggregation or combination of nervous fibres, each of which might be designated by a certain number, letter, or word. Thus we may use certain letters of the alphabet to designate certain combinations of nervous fibres. The letters indicating the combinations may be further arranged in a geometric series, as in the subjoined diagram, and it will be immediately observed, that in the first line we have one letter, in the second two, in the third four, in the fourth eight, all having relation to each other.



In assigning the substantive word to any action, a combination which is common to, or forms part of, a great number of images is commonly selected; thus, if a b c d form a combination which is always present when a man is represented to our senses, we may give to that combination the form *man*, or in symbolic language A, which will be found to include these letters.

It will thus be seen that generally a substantive is a part of speech given to the action on a combination of nervous

elements, which are affected in common by a large class of objects, and is, therefore, in itself a very general term. The words *man, dog, ground, star,* may serve as an example of the noun or substantive. Grammatically a noun may be defined to be a word used for some action, real or imaginary, which has occurred in the brain, and really signifies an action of definite combination of nervous symbols at one moment of time. It is immaterial whether the images to which we have given the names of nouns are produced by actions through the organs of sensation, or whether they are mere thoughts, and have no external existence, as a word of the nature of a noun may be given to any action of the sensorium.

A mere noun can convey little or no knowledge when used by itself; for instance, the word *man* used apart from any other word, either implied or understood, would, by itself, communicate no real knowledge from one person to another, as it would neither express who the man was, where he was, what he was doing, or, in fact, any other circumstance concerning him, or even whether the image to which it referred was used to signify a thought or a reality.

Great difficulties arise to persons who have never seen an object. It is almost impossible to make a child understand a hill when it has ever lived on a plain, and so it is impossible to communicate to a person who has never seen the sea, what the ocean is like.

For the purpose of more accurately defining the noun, we add some word common to another combination of actions, or virtually we add a word, having some of the properties of a second noun, to it; but the second word so added, we term the adjective. Thus if we speak of a good man, we have defined the character of the man, or limited our

observation to a man who is characterized by some quality of goodness. If A represents a man, B comprises the combinations of the actions of the brain, which we term goodness; then if we speak of A with some portion of B conjoined, we have restricted or limited our observation to the combinations of A, to which some of B are added.

It will be perceived that there is nothing peculiar or definite in either A or B, which should entitle it *per se* to the name of a noun or adjective, for either might be the noun, and either might be the adjective, and yet the effect would be very different. In the one case we should have *good man;* in the other, *manly goodness.* In these cases, the combination to which we desire to call attention is the noun, and must be accurately defined, and the word by which the extent of the noun is limited, is called the adjective.

When we used a word adjectively and couple it to a noun, the adjective implies that only a portion of the actions of the brain which led to the idea from whence the word is derived, is coupled with the noun; hence, as the amount varies, we have various degrees of the word used adjectively, as *good, better, best.* The information conveyed by an adjective, is not of that positive character which is conveyed by a substantive; and when I say a good man, I should express it by symbols, by using A for man and B—? for some unspecified amount of goodness. If I said or wished to express manly goodness, I should use B for *goodness* and A—? for *manly.*

It follows from the above remarks, that the adjective is a far less perfect part of speech and is unable to be used for the communication of those absolute ideas, which may be communicated by the use of the noun.

There are other classes of words which require but

little comment; thus we employ pronouns to prevent the repetition of nouns. These words have no meaning in themselves, unless some noun, either expressed or implied, has preceded their use, and both grammatically and biologically they must be referred to the class of nouns.

Various questions have been raised as to the use and signification of the articles *a* and *the*. It appears to me that, biologically considered, *a* is employed to signify any one or some unknown one. The word *the* seems to have the power of limitation to some particular one or some particular class. In accurate symbolic language wherever *the* is employed, it is necessary that the additional description should be applied to the noun, to mark the individual or class to which the word *the* limits the application of the noun; thus, a man signifies any man, the man, some one particular man, and the word man, without any prefix, signifies all men.

By the combined use of the noun-adjective and article, we are thus enabled to give a more or less correct picture of any real or imaginary object to a second person; but it appears most especially necessary that these words should be used in the same sense by both persons, otherwise no true information is communicated, and both adjective and article limit the comprehensiveness of the word man.

The mere use of the noun, however, gives us by itself no real information, because a second person would require to be informed whether any word represented a mere thought or image of the imagination, or a reality; in fact, whether it referred to an object which existed in all its integrity in the external world, and which produced the action upon the organs of sensation.

The words used to express this important part of the idea, are termed verbs. But a verb does more than this, it

signifies the relation of the thought or reality to other thoughts or realities. In fact, it marks the time of the occurrence of the thought or of the reality. Biologically, we may define a verb to be a word used to signify the successive changes on the sensorium of the respective portions of one image, and their relation to those of other images.

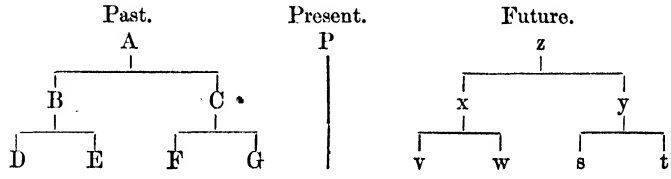
To explain this definition, it is important to remember that the brain is one large organ, on which a series of impressions are being continually made, both from the action of external agents upon the organs of sensation, as well as from the changes going on within our own frame. If a thought or reality occurs at the moment at which we are actually receiving the second impression, then we speak of the time present, and we say *It is*. Suppose A B C D to represent primitive nervous fibrils, and w x y z to represent other nervous fibrils, if the actions on B C and x y coincided at the moment when x y was being excited, we should state that the idea derived from B C existed at the present time, or in the language of the verb *is* or *exists*. Now if we examine the changes which are continually occurring in the mental images, we may express them in two series in the following manner:

1st	A B	A B	A B	B C	C D	A B
2nd	l m	m n	n o	o p	q r	s t

In the above diagram we perceive that the two series of changes take place unequally. It is from this double series of ideas that we derive our notions of time, for those combinations which change least energetically, are said to occupy the longest time. For practical purposes, we select one series of changes as those of a clock, or the changes produced

by the revolution of the earth as a standard, and refer all other changes to those.

Practically, when we use verbs, we do not set out accurately the changes which actually take place, but we employ words to signify time present, time past, or time to come. All verbs may be conveniently arranged into two geometric series, the one signifying time past, the second, time to come, the two being divided by a line, denoting time present; or we may unite the three together into one series signifying all time.



But most verbs show more than the time of the occurrence of any idea; or rather the relation of any one idea to any second idea; for if examined, they will be found to communicate some knowledge similar to that imparted by the noun; and hence these verbs might be called substantive-verbs. If I say that John *sits*, it not only indicates John, and his existence at the present moment, but it goes further, it shows his posture. In like manner if I say, *I think*, it not only indicates time present, but it shows that the idea is an action of the brain, which has not necessary external existence.

Substantive-verbs communicate even a far greater range of ideas; thus, if I say that John came from Brighton, the words *came from* would not only represent that John was at Brighton and is now here, but they infer all those changes which occurred during the act of coming here. And if we regard the motion of the carriages, the change of the

view, the number of ticks of a watch, the pulsations of the heart, the occurrence of thoughts during the journey, the changes would be almost infinite in number. All these changes it would be too long and tedious to recount, and yet they are all included in the word *came*.

A verb has essentially a reference to some change, for without change the verbs cannot be used; and even when we mark the present time, that present has relation to the past and future.

The adverb is another part of speech, which still further gives exactness to our descriptions, by limiting the scope of any observations. It is frequently used merely to assign the value or extent to an adjective or verb, as in the case of *nearly, chiefly, exceedingly, very*. Other adverbs perform the same functions to the verb as the adjective does to the noun; as in the words *prudently, softly*, when in these cases they limit the extent of the meaning of the verb, by adding to it a certain amount of the properties of prudence, softness, &c.

Prepositions are used to show the mutual relation or position of separate ideas; as in the words *above, below, behind*. In these cases they show the manner in which the image is received by the senses. Biologically, they help in many cases to signify the particular combination which is represented to the mind; thus, a man, placed upon a horse would be represented by a different combination of nervous elements from that which would be produced by a man below, behind, or before a horse. A very different idea is signified when we say that a man came from Brighton to London, from that which is communicated when we say that a man came from London to Brighton.

Conjunctions are employed either to compress two ideas into one, or to separate one portion from a more extensive idea. In the first case, the conjunction is called copulative;

in the second, disjunctive; conjunctions are, in fact, equivalent to the signs of *plus* and *minus*.

Such is a brief *resumé* of the mode of communicating impressions made on the sensorium, from one person to another. In the first place, we use a noun, which is a sort of generic term given to certain combinations common to many ideas. This general idea is then limited by the adjective, and still further by the adverb. The verb is then employed to signify the time of the occurrence of the idea, or to describe the changes which took place with it; and these changes are more particularised by the use of other adverbs. We, however, introduce other nouns; and their relations are more accurately detailed by prepositions and conjunctions. It is manifest that the whole system is artificial, and whilst we must deplore its insufficiency to communicate exact ideas, yet we must, at the same time, marvel at the great and glorious results which it has been the means of effecting.

Resolution of a Sentence.—From the observations which I have already made, we are now in a condition to resolve a sentence, or so to set it out, that it may appear on paper as it would have acted on the brain, had it been a reality instead of a mere description; and this resolution would not be difficult were the idea confined to the same instant of time, but a variation of time involves a succession of ideas, which it is difficult to express.

In the first place, we must arrange the substantives in their natural relations, and we must put those substantives, which are most comprehensive in their meaning, which contain the largest number of known parts, at the top; then we may place successively lower all those which contain a smaller number of parts or specific combinations in the mind.

Upon this plan we should arrange the substantives, Animals, Brutes, Man, Reds, Whites, in the following manner:

Animals A

Brutes B — Man C

D — E — Reds F — Whites G

In this case we have three degrees of magnitude in the specification of these words. Animals A, may be said to consist of — Man C of Whites G, and Reds express the same definition as Whites; and may be represented by F. Now the word Brute in this arrangement, has the same amount of definition comprehensively in relation to animals as that of Man, and may be expressed by B.

In this case I have only assumed one letter for the specific qualities of each noun; but if the signification of any word can possibly be disputed, then instead of one letter we must use a series of letters expressive of the qualities in such a way, that there can be no dispute upon the exact limit of the word, for until any two disputants agree precisely upon the signification of the word, any superstructure in argument based upon it may be rendered of no effect. When the meaning of any word is under dispute, it must be unravelled by other words, till the disputants have the same ideas for the same words.

Naturalists use, in some respects, a similar mode of describing different animals; as when they divide them into individuals, species, genera, orders, classes, &c.; and chemists more accurately note the composition of substances by symbols in an analogous manner.

When arranging substantives into their relative position, we should bear in mind any word which is appended to them to limit their signification, such as the adjective; for instance, if I speak of 'a man,' 'a white man,' 'a happy

white man,' I have three different degrees of limitation in the three different cases.

So also with regard to the adverb joined to the adjective, the meaning is more particularised, as 'a very happy white man' bears a different amount of limitation to that expressed by 'a happy white man.'

As, moreover, prepositions have so far an effect upon the meaning of the noun, as to limit, or particularise its signification, we must also add their value to the noun in any formal resolution of a sentence, as different significations would be expressed by 'to London,' 'into London,' 'upon London,' 'above London,' 'below London,' 'around London,' 'about London.'

When two nouns are joined together by a conjunction, they collectively form one idea, as 'John and Thomas.' Sometimes the idea is limited by their use, as 'all but Thomas,' where the meaning is lessened by the conjunction. In this way the copulative conjunction is equivalent to the sign *plus*, and the disjunctive to the sign *minus*.

Perhaps, upon the whole, nouns having certain properties in common, had better be divided into the geometric series, 2, 4, 8, 16; and thus every term might be distinguished from every other term. By this arrangement, every word would signify the half of a word above it, and would conjoin the meanings of two words below it. This division appears to me well deserving the attention of naturalists, chemists, and other writers requiring the use of a large number of words. In application, partial difficulties would frequently arise, because practically odd numbers would interfere, but nevertheless, by a little management, such a division might doubtless be usefully effected.

Having considered the best mode of arranging the nouns, we are naturally led to consider their mutual relations,

together with the effect of the verb upon them. Verbs appear to signify a more complete set of actions than the noun, and in my 'Instinct and Reason,' I have shown that animals do not appear to have the power of appreciating their use. Some verbs simply show existence of an idea, as a thought, or a reality, at the time present. This hardly requires a sign for its designation; for it might be understood, that when we say, 'John, here,' that he *is* here. But any idea, be it a thought, or be it a reality not now existing, must have either existed at some former period, or may exist at any future time; and the time either present, past, or future, may be represented with accuracy in a series as before described.

But the verb, besides describing the time at which the event occurred, expresses some substantive idea, then this addition must be appended to the noun to which it refers, as 'John runs;' the word *runs* gives two ideas, one that John is in the act of running or performing the motion of running; the second, that this action is now taking place.

In many cases, verbs have relation to two substantives, as 'John killed Thomas.' In this expression, we understand that at some time past, the act of killing was done by John on Thomas, the first individual performed certain actions which caused a second set of actions to supervene on Thomas. The verb here modifies the ideas which we derive of both nouns; and the sentence gives us the idea of at least three different states.

First,—John and Thomas both alive.

Second,—John in action—Thomas being acted upon.

Third,—John alive—Thomas dead.

These series of changes or sequences stand in relation as Cause to Effect, and in language may be rendered, that John caused the death of Thomas.

If we regard the origin of our ideas of Cause and Effect, we find that the idea of Cause is deduced from a change of matter acting upon other matter: the first change is called the Cause; the second, the Effect. Thus when we say that the fire causes the water to boil, we mean that the coal is combining with oxygen, and the two are being converted into carbonic acid, which change acts upon the water and turns it to steam; the first change being the Cause; the second, the Effect. They may thus be regarded as primary and secondary changes.

The limitation of the verb by the adverb, may be treated as we limit the signification of the noun by the adjective; so, also, parts of a sentence coupled together or dissevered by conjunctions, may be treated as when used with nouns.

We are now in a condition to express any definite sentence by a series of letters, and give to it a definite form for the purpose of disputation or study. It is absolutely necessary to set out the meaning of each word, so that its signification may be accurately defined; and hence, in some cases, it may be requisite to express a word by the combination of ideas which constitutes that word; thus if we use the word John, it may be necessary in some cases to show that John is of a certain family, and that he is a citizen, a Londoner, a white, a European, a man, an animal, an organised being.

In the resolution of a sentence we first set down the designation of the thing or person that first undergoes a change. This becomes a cause. The causality may be expressed by other letters, and designated according as we are enabled to communicate the manner of the cause. We next note the noun which is effected, and the value of the effect produced; and, finally, we designate the time at which the whole series of changes occurred.

As an example of this mode of notation, we may set

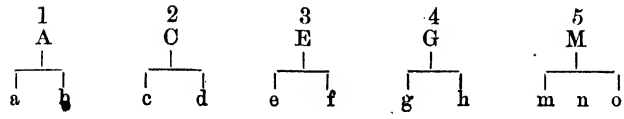
down, 'John and Thomas killed William.' Let J stand for John, T for Thomas, C for causality, D for death, E for effect, W for William, P for the past; which according to the natural process of thought would point to different distinct ideas having mutual relations, thus:—

JTC WED P

In the first place, John and Thomas underwent certain changes, in consequence of which, in the second place, William underwent certain changes to death, the whole happening at some time past.

This mode of notation may, at first sight, appear more complicated than ordinary language; but if carefully studied, it will be found to afford us an artificial mode of reasoning, which, although immensely inferior to that which is in actual operation by the elaborate machine furnished us by nature, yet as far as it goes, may be conducted by fixed and immutable laws.

In reality the various changes indicated by the verb occur at different times. In any process of thought arising therefrom, the whole appears to the mind at one time. This constitutes a great difficulty in the notation of a sentence by cyphers, and can only be effected by several series of geometrical arrangements. One would be required for the description of the object changing, another for the description of the nature of the change, a third for noting the object effected, a fourth for the nature of the effect, and, lastly, we should require one series to denote the time of the whole series. This last had better be divided into three parts instead of two, to signify the past, the present, and the future.



Induction.—I have now to treat of the method by which the mind classifies a series of facts, so as to represent them by the shortest possible method. It is a faculty of great importance to man; inasmuch as by it he is enabled to communicate a large number of facts in a few words.

The process of induction consists in finding a definite and constant connexion between two or more parts of any images, or sequences of images. When, for instance, we find that every individual person dies, whether male or female, we learn a number of individual facts, or rather, we ascertain that a number of human beings have ceased to live, and taken on the various changes of death. We then ascertain that that which we call Humanity is common to all the cases, as one part of the fact; and that that which we call Death, is common; and this constitutes the second part of the fact: hence is induced that man is mortal, or, in other words, that humanity and death are invariably conjoined at one time or other.

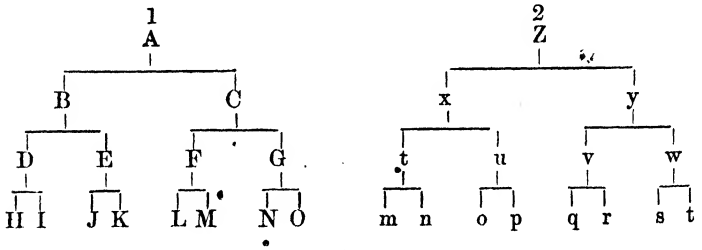
To illustrate the nature of induction, we may take a number of combinations of nervous elements, and call them by letters. If the combination A represents that part of an idea which is possessed by all men, and W the combination given by a sense of feeling, then, if we find that where A is present W is present, we have acquired a most important information; for if A is present ten thousand times, there will W exist. If B represents that which is common to man, and we find it always conjoined with X, denoting rationality, then we know that all men are rational; so if C represents that which is common to whites, and Y denotes

happiness, and D represents the peculiarities of Englishmen, and Z the characteristics of freedom, then by this series of inductions we have acquired most important knowledge.

D C B A W X Y Z

But we observe, that man partakes of the properties of A B, therefore, he is W X, or is possessed of feeling and rationality. Whites possess the characteristic of A B C, and therefore manifest W X Y, that is to say, they feel, are rational and happy. Lastly, Englishmen being designated by A B C D, manifest the properties of W X Y Z, or evince feeling, rationality, happiness, and freedom.

The above statements may be also arranged as two geometric series, which for many causes are more convenient for study.



By this arrangement in the first series, A would stand for animal, B for man, D for whites, H for English. In the second series, it is manifest that feeling, rationality, happiness, and freedom, do not possess any immediate relation to each other, and therefore in the absence of any definite knowledge upon this matter, they may be arbitrarily assigned the symbols of m, n, p, r, in the fourth row.

It may be useful to consider a few specimens of inductions arranged in different classes, that we may the more properly estimate their value to man. For this purpose, we

may consider them under six heads:—Absolute Inductions, Probable Inductions, Possible Inductions, Inductions of Means, Inductions of Limits, Hypothetical Inductions.

Of absolute inductions we find good illustrations in the properties of numbers: thus, if one be added to one, it makes two; if two be multiplied by two it makes four. These instances are so familiar, that we are apt to forget that they are inductions; but if I state that the square of any number is equal to the sum of as many consecutive odd numbers beginning with units, as there are units in that number, as thus, $6 \times 6 = 1 + 3 + 5 + 7 + 9 + 11$, there probably will be but few of my readers who would be aware of the fact, and would only believe it after they had satisfied themselves upon the matter. Other examples of absolute inductions may be observed in our knowledge of the properties of geometric figures.

The next class of inductions which we have to consider, may be termed Inductions of Probabilities, because we induce a law of probability from a certain number of facts. This induction will not express to us the absolute fact in any one particular case. As an example of a probable induction, we may instance that of the sex of children, which for our present purposes we may assume to be half male and half female. From this induction our knowledge is so far incomplete, that we cannot tell when a child is about to be born, whether it will be male or female; though we can calculate with tolerable certainty that out of a thousand children, five hundred will be males, five hundred females; but we cannot tell from this knowledge which five hundred will be males and which five hundred females.

Of possible inductions, we may take in illustration the following assumed fact: amongst a thousand children one is born with six fingers, and we have no information as to the

precise one which is the subject of the monstrosity. It is manifest that with this knowledge, it is possible that any one may be the subject of the disease.

The Induction of Means is another kind of knowledge of considerable utility. This species of induction consists in ascertaining the sum of the values of a certain number of objects, when by dividing it by that number, we obtain the mean value. If we discover that four men weigh four hundredweight, then we know the mean weight of each of the four men, though we do not know in any one case the absolute weight.

The Induction of Means is much increased in value when we have the limits of variation between the different individual instances; thus, a mean of 4 may be obtained between the limits of 7 and 1, 6 and 2, or 5 and 3.

There is yet one other mode of induction, which investigators frequently employ with advantage. Having carefully examined a single fact they assume a law from it, and they compare other facts to see how far they agree or disagree with that law. This is called a Hypothetical Induction. This form of induction is most valuable if the investigator never forgets that it is a mere Hypothesis; but, on the contrary, if he bends his other facts to suit the Hypothesis, then this form of induction is in the highest degree dangerous, as tending to error.

On Deduction.—As by the process of induction we are enabled to classify a large number of facts under one general rule; so by deduction we are enabled to apply this induced knowledge to any particular instance. As an example of a deduction, we may take, as an illustration, the deduction: 'Man is mortal,' or, in other language, man A always suffers death Z. From this induction we rightly deduce that John A + B is liable to death, because John contains A,

the properties of a man, in his organisation; or we may express the fact by symbols, that A + B is conjoined with Z.

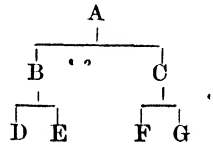
Deductions are of two kinds, perfect and imperfect. In all cases of perfect deductions, the inference derived from the law is certain; thus, if I have twenty pounds, and add thereto twenty pounds, I may of certainty deduce that I shall then have forty pounds, because I have previously learnt by induction that twenty and twenty make forty.

Imperfect deductions may be divided into several departments, for every deduction is imperfect in which the law which is sought to be applied is not absolute. From this cause it follows, that a deduction, or hypothetical induction, or an induction of means and limits when applied to any particular instance, is necessarily incomplete and unsatisfactory.

As an example of an imperfect deduction, I will assume as a law, that amongst great masses of children half are boys, half are girls. From this law it follows deductively, that of one thousand children we should probably have five hundred of each sex; but it by no means follows that out of ten children we should have five of each, for it might happen that the boys and girls are grouped together in masses of each, and therefore the law would not apply to very small numbers.

Laws of Thought.—I have shown how every word may be expressed by a cypher; and I have pointed out the manner in which we can express all ideas by this mode of notation. These symbols when rightly arranged as a geometric series, have certain properties to which the laws of thought are obedient, and are most important to be studied and thoroughly understood, and it will be now my business to endeavour to explain them.

Each symbol expresses something in nature which does not stand alone, but has certain relations to other symbols. If we arrange these symbols as a geometrical series, each letter would comprise the properties of a part of a symbol above it, and those of two symbols below it, and differ in some condition from those beside it: thus, let A represent animals, B brutes, C man, D blacks, E whites.



In this case A possesses properties common to the whole symbols; B, properties common to D E.

These symbols, geometrically arranged, may be called higher, lower, and equal: the higher comprise those in which the characteristics are more general, such as A in relation to B C; the lower, those in which they are more specific, as D in relation to B, as B to C; and the equal, those of similar relation of definition.

The laws of these relations constitute the entire laws of thought, and all which possibly can be learnt by the reasoning powers from any given facts.

1. Symbols such as a letter or word denoting ideas, are limited in number, although that limitation is so enormous that no man will ever be cognizant of them all.
2. Each symbol denotes a positive action, or combination of actions, in the brain, as D may stand for a black man.
3. A mere negation only expresses that an action or a symbol is absent, as no B would denote the absence of B.
4. A positive symbol with a negative attached, limits the signification of the positive symbol, as if we used B—E, or a minus of some subdivision of E.

5. Every symbol has something in common with every other symbol, as both D and G would have some property of A.
6. Higher symbols confer their entire power upon all their lower symbols, of which they are composed, such as what is affirmed of A is affirmed of B C D E F G.
7. Lower symbols confer some power upon all their higher symbols, as what is affirmed of G is partially affirmed of C and A.
8. Equal symbols do not directly affect each other, as what is affirmed of D does not necessarily affect G.
9. A combination of symbols possesses the combined powers of each separately, such as what is affirmed of D E F G combined, is affirmed of B C A.
10. A symbol partially affects some of the higher symbols of its equals. What is affirmed of D partially affects A.
11. A symbol does not affect the lower symbols of its equals. What is affirmed of B has no direct effect on F G.

As the act of thinking by words consists in comparing the relations of symbols, so that of judgment determines whether the two sets of symbols agree or disagree. By judgment we determine Affirmation, Negation, Probability, and Possibility.

1. Affirmation consists in the absolute agreement between two sets of symbols; thus, A B and A B are alike.
2. Negation, on the contrary, consists in a non-agreement between two sets of symbols; as A is not A B, A B C is not A B, C is not A B. Cases of negation resolve themselves into three classes,—first, those which comprise cases in which the two sets of symbols agree, as far as they go, the second set being deficient in

amount; secondly, those in which the symbols agree up to a certain point, but the second has something added; and, lastly, those in which there is an entire non-agreement between the symbols.

3. Probability consists in the concurrence of all the known symbols in one set of symbols with those of a second set.

   Thus A B C plus some unknown, is probably A B C D.

   The degree of probability in different cases is inferred from the extent of the concurrence; or rather we may say, from the proportion of the amount of unknown parts.

4. Possibility consists in the absence of any positive discordance between the unknown symbols of two sets.

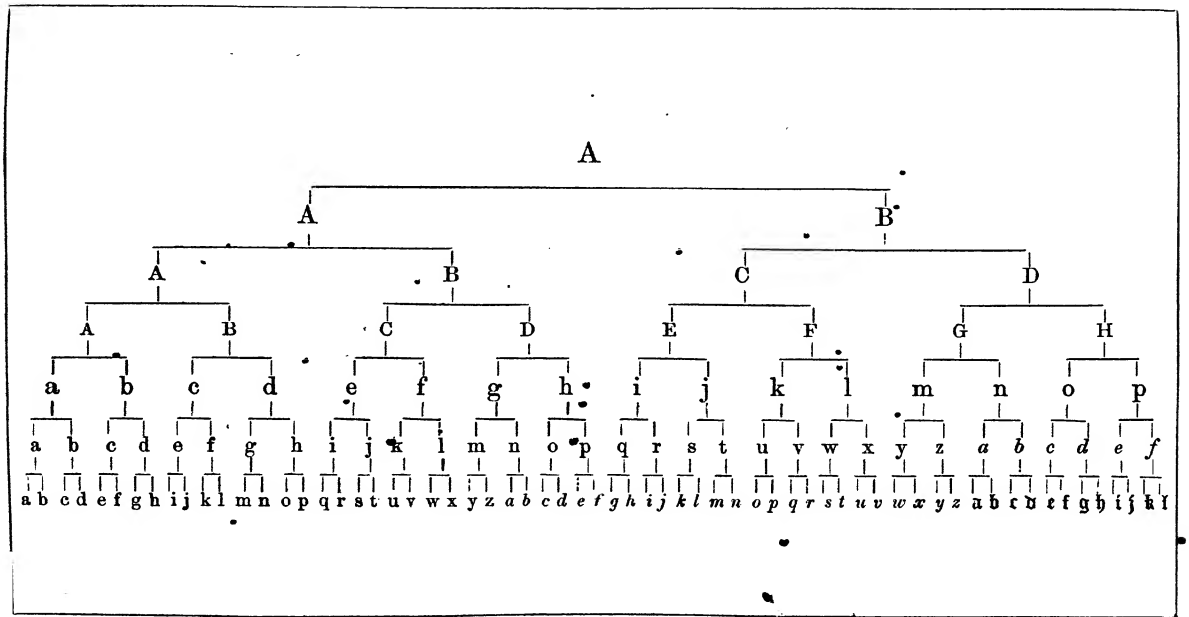
   Thus, X Y plus some unknown may be possibly A B with some unknown, because both sets may consist of A B X Y.

5. An answer is absolute when the two sets compared consist of known symbols.

6. An answer is only probable or possible if a probable or possible symbol enter into either of the two sets compared.

7 An answer is only to the average, if either set of symbols contains an average statement.

I have now shortly detailed the laws of thought adapted to words and language, and exemplified by the use of symbols. For the purpose of studying these laws, the student is referred to the geometric series of symbols at page 91; and he will readily perceive their importance and truth. In all disputes and discussions, having once referred the words employed to their proper relation in the series, the legitimate deductions can be immediately learned, and thus a far greater certainty may be given to our mode of reasoning.



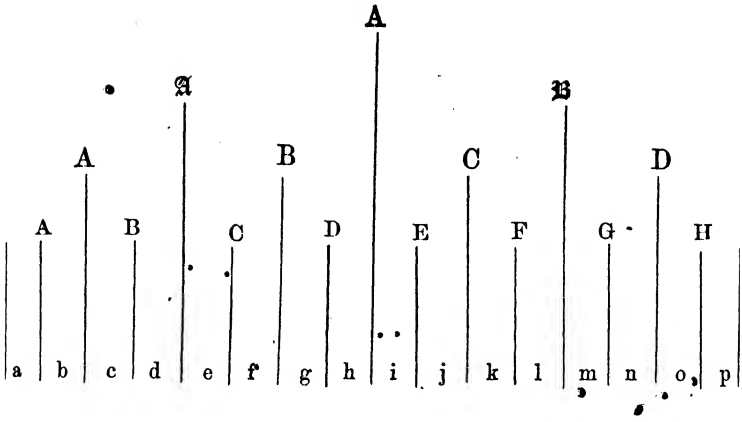
GEOMETRICAL SERIES OF CYPHERS

Relational and Differential Machines.—From the laws which have been already detailed, it is apparent that thought is amenable to fixed principles. By taking advantage of a knowledge of these principles it occurred to me that mechanical contrivances might be formed which should obey similar laws, and give those results which some may have considered only obtainable by the operation of the mind itself.

In order to induce a general law from specific instances, and deduce the application of a law to a particular case by means of mechanical contrivances, we must take advantage of the geometrical arrangement of words formerly described, and denote each word by a cypher, and lastly arrange them in such a manner that each cypher may bear its proper relation to every other cypher.

The application of the geometric arrangement of cyphers may be best represented by any contrivance, the parts of which continually divide by a hinge joint into two portions. Nothing apparently can be more simple than this arrangement; though, practically, for large series, the details are so troublesome, that it has required much more labour to bring it into a working form than I had originally anticipated, owing to the difficulty which arises from the necessity of a large number of parts being compelled to move all upon the other parts of the contrivance, which is absolutely necessary to the construction of the machine.

I have before me, whilst I write, seven or eight varieties of these contrivances, some of which have their fixed points at the top of the geometric series, and some at the other extremity of the same. Perhaps the construction of the latter may be illustrated by a number of lines and letters as in the annexed diagram for a series of sixteen, thus :—



In this case the fixed point of every line is at the bottom of the diagram, and each is represented as fixed upon a board. The whole is now shown as open, but it will be seen that when closed the act of opening any one of the lowest set would partially influence its corresponding cypher in the series above it. This form illustrates the principle exceedingly well, is simple in its construction, and by a proper use of readings is applicable in all cases.

Upon the whole, however, perhaps the fixed point had better be placed at the upper part of the series, and as there are some difficulties in constructing it to work as a triangle, it may be arranged to shut up as a parallelogram.

This kind of motion, requiring whole series of movements to move upon other movements, is a new requisite in mechanical contrivances; or at any rate I am unacquainted with its use amongst the machines which abound in this great metropolis.

When the vast extent of a machine sufficiently large to include all words and sequences is considered, we at once observe the absolute impossibility of forming one for such an extended application, inasmuch as it would cover an area

exceeding probably all London, and the very attempt to move its respective parts upon each other, would inevitably cause its own destruction. Nevertheless, those lesser machines containing but a few elements, exemplify the principles of their operation, and demonstrate those laws of

RELATIONAL MACHINE.

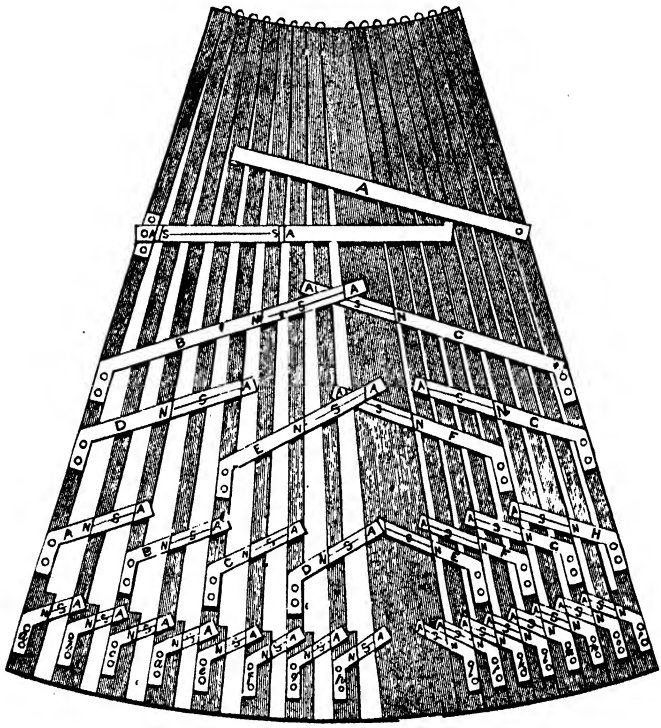


Fig. 8.

induction, deduction, and relation, the right use of which cannot fail to render our thoughts more accurate, and our language more precise.

I have also devised a relational slate which the student

may profitably use in the study of thought or for accuracy of reasoning. It is thus marked.

If we examine the results which can be obtained from the use of the relational machine, we observe that an action represented by an opening at any point represents a similar action upon every other element placed below it in the series, and also a partial action of every element having relation to it at the higher part of the series, hence the value of every expression, and its relations to other expressions, can be read off.

The machine, however, can do more than this; for two or more facts, or two or more assertions, can be represented by actions in a similar manner. Like the human brain, it is competent to give the resultant of any number of propositions be they ever so numerous, and show their mutual bearings upon each other.

If the machine were sufficiently extensive to comprise every fact or principle which has been ascertained, then when any new fact is learnt it might be appended, and its bearings upon more general instances, or more particular cases, would be immediately shown.

It is thus apparent that this mechanism gives an analogous representation of the natural process of thought, as perfectly as a human contrivance can well be expected to afford; yet we perceive how limited is the knowledge which it is competent to convey, when compared with that which is obtainable by the mind through the natural operation of the brain.

In examining the relations derivable from a knowledge of sequences, we must have recourse to that artificial system of notation described in the chapter on the resolution of a sentence. We must record the substantive changing in one geometric series; the nature of the change, in a second;

the substantive acted upon, in a third; and the nature of the changes which it undergoes, in a fourth. If all the words in each division were placed in their proper relation, then any action on the machine indicates every principle which is inducible, or every fact which is deducible from the assertion. In like manner, the resultant of any number of assertions is immediately shown in the form of inductions or deductions. It is not necessary in practice to have a separate series for each subject, for the force of each word can be studied separately, together with its relation to other words, and their relation to the other subjects can be ascertained. Supposing that the machine could be made sufficiently extensive for all practical purposes, yet the labour of employing it would be so great, that persons would soon rely upon the abilities which it has pleased Providence to give to them, and not seek assistance from extraneous sources.

The relational machine can also be employed, to a slight extent, as either an addition, subtraction, or multiplication machine, with all the advantages attached to the use of the functions of the geometric series. To all who understand the use of logarithms, this must be sufficiently apparent, without troubling my readers with a further description.

The relational machine may be so constructed, that when one of the higher or more comprehensive symbols is exemplified upon it by an action to an unknown extent, as in the general assertion of *some*, the deductions in the lower series, or more particular series, will exemplify the uncertainty as to the particular ones which are effected; thus if we know that some men are short and some tall, then in the lower readings we shall find that it is impossible to indicate from that general principle, which particular ones are short or which are tall.

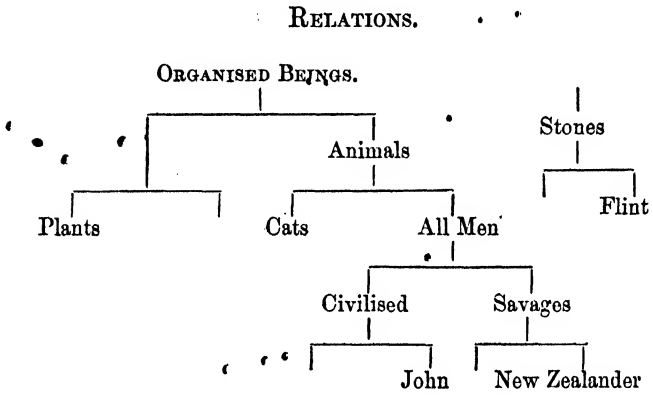
RELATIONAL SLATE.

A							
A				B			
A		B		C		D	
a	b	c	d	e	f	g	h
a b	c d	e f	g h	i k	l m	n o	p q

The Relational Slate is divided into a geometrical series of spaces. For the purpose of ascertaining the effect which any statement may have upon other cases, the words expressing that which contains the subject to be investigated should be inserted in any one compartment about the middle of the slate. All other words are then placed in relation to these in the following manner:—Words bearing the same meaning must be placed in the same compartment. Words designating a portion of the objects which are described under the first word are placed in lower compartments, each having its proper relation to the rest. These lower words obey the properties of lower geometrical symbols. Words which comprise a greater range of meaning than the first words are placed above the first words, and obey the properties of higher symbols. Words which are neither more comprehensive, nor more limited in their meaning, and of which no relation is known, should be inserted in some other part of the series, completely beyond the highest words whose relations are known, and obey the laws of extraneous geometrical symbols. Lastly, if no relation is known for a word, it may be inserted at any point with a query after it. Having placed the words in relation, the assertion is entirely true of all the lower words, and only partially true of all the higher words, and has no bearing upon the extraneous words.

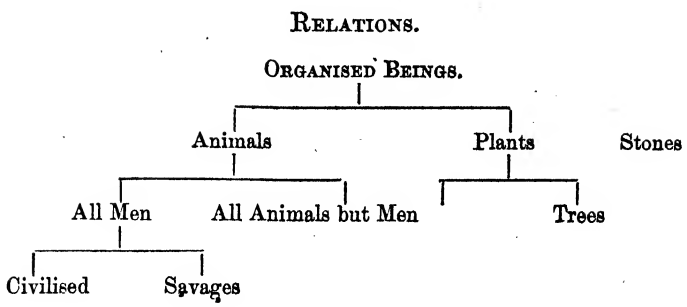
Example.—Required to know the inferences deducible from the premisses—All men die. Savages are a portion

of mankind. All men who are not savages are civilised. Organised beings comprise animals. The New Zealanders are a portion of the savages. John is a civilised man. Cats are a portion of animals, but not of men. Stones are not a portion of organised beings. Flint is one of all stones. Plants are a part of organised beings.



Answer.—Savages, Civilised People, John, and New Zealanders are lower symbols, consequently they all die, Organised Beings and Animals are higher symbols, therefore some of each die; but Plants, Stones, and Flint are extraneous symbols, therefore nothing is stated with regard to their deaths.

Example of a resultant of several Propositions.—Civilised Men die. Stones are not organised beings; Trees die; Savages die; Plants comprise trees and other vegetables. All men are either civilised or savages. Those animals which are not men die. Plants and animals comprise the whole of organised beings. Required to know what inference may be drawn from these premisses.



Answer.—Civilised men and savages confer their whole power on all men, therefore they die. All men, and all animals but men, confer their whole power on animals, therefore they all die. Trees confer some power on plants, some of which consequently die; and all animals, and some plants, confer a partial power on organised beings, some of which therefore only die. Stones, being extraneous to the subject, are not affected by these premisses.

By the natural powers of thought the mind also possesses a spontaneity,—a power by which bygone impressions appear, constituting an act of memory. These the mind treats according to all the symbols impressed on the brain, and moulds them into one harmonious whole to constitute an act of imagination. This property, ever active in the fertile minds of our dramatic and novelist writers, is never exercised without due regard to the experiences which have been afforded of the natural sequences of events. The mere conception of an idea would be useless unless its relation to other ideas and other events was fully shown; and the exercise of the faculties of remembering, combining, and comparing ideas, is amply shown in man, and indicates a power of adaptation in his cerebral organisation as given by Nature infinitely superior to any human contrivance however ingenious. We thus perceive that, whether we study

the mechanical arrangements of the bones, the optical structure of the eye, the hydrostatic apparatus for the circulation of the blood, the acoustic arrangements for hearing, the mechanism of muscular motion, the generation of force, or that physical structure which is the instrument of the mind, we are equally astonished at the infinite perfection of their design. This cannot fail to show to man his utter insignificance in his inventive skill, as displayed in his mechanical contrivances, when contrasted with the wonderful example of creative power which his own beautiful and perfect organisation affords, and must make him deeply feel the infinite perfection of Nature.

Not only can we take advantage of the laws of induction and deduction, and exemplify them by mechanism, but we can also in the same way exemplify the laws of judgment by pieces of mechanism of a different description, which may be termed the differential machines.

In estimating the differences between any two assertions by artificial contrivances, it is necessary to have some mechanism to represent each assertion. For this purpose we may take a wire or pin, and divide it by spaces, represented by certain symbols. Opposite to each symbol, which must represent some word or fact, we must have the means of noting whether the character of the subject is absolutely known, or unknown, by using some appendage of two different dimensions (A B, fig. 9). By this con-

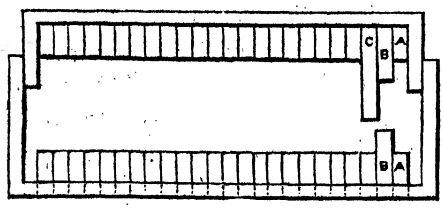


Fig. 9.

trivance, we can accurately set out one side of the case. Opposed to this, we must use a second pin, with appendages competent to represent by three different sizes, A B C, either similarity, dissimilarity, or unknown; then by bringing the two series together, an answer as to its actual, probable, possible, or negative concurrence may be obtained.

For instance, if in a definite set of symbols the value of each is known, each would be represented by a space of one. If, on the other side, the value of each was similarly represented, then the two might shut together in the space of two, and the reading would be 'Yes.' If on either side some of the values of the cypher or the word were unknown, then the two when brought together would occupy the space of three, and the reading would be 'Probable;' but if for any one cypher the value on both sides was unknown, the space occupied would be four, and the reading given would be 'Possibly.' Lastly, if on the two sides any two symbols disagree, that want of accordance would be represented by a contrivance occupying the bulk of four on the second side, and when brought together the amount would be five, for which the reading of 'No' would be given.

By the differential machine it would be possible on one side to arrange all the facts or principles which should direct a judgment on a given point, by which means, when specific facts were registered on the opposite side, the concurrence, non-concurrence, probability, or possibility, would be immediately shown. Perhaps this might be beneficially brought into use by those who use fixed and unchangeable creeds; for if they be arranged correctly then any deviation from them would be immediately registered. It must be apparent that such a machine would not estimate the quality of the

creed, but only show whether any new creed, or portion of creed, coincided or not with the former creed. For whether the creed inferred a belief in the true God, in Mohammed, in ibises, crocodiles, or saints, the effect would be the same, as these beliefs being assumed as true, the truth of that which is compared with them is ascertained according to them. There are many other cases where such a contrivance might be beneficially employed; for whenever passion or powerful feeling is likely to interfere with a sober and correct judgment, then the examination of each part separately is likely to be properly used when the mechanical answering upon the whole case will be, although immediately performed by a human contrivance, according to those principles which regulate the action of the brain in such circumstances.

Nothing can show more usefully than this machine the futility of guessing at any decision without any or sufficient information upon which to form an opinion; for if, at random, certain actions be rendered on both sides of the machine, then the almost certain impossibility of ever arriving at a true concordance will be speedily found upon trial. What is true of this piece of mechanism is true of the mind, which sufficiently teaches how slow we should be to pass an opinion without a knowledge of all the facts which bear upon the question.

By using the relational and differential machines together, we are enabled to obtain the bearing of any facts, or to arrive at any conclusion to which the mind by itself is competent. From any definite number of premisses the correct answer may be obtained by a process imitating, as near as possible, the natural process of thought.

It would be a great boon to the community if the Judges, notwithstanding their high integrity, would use such an

instrument, as then what one calls right would not be called by a second wrong. A mechanical judge would be a boon to the whole civilised world.

The Differential Slate is designed to illustrate the laws of judgment, and to show their application to complex instances. For this purpose lines are ruled upon the slate to form spaces in which to insert every statement in one of the cases with which a second is compared. Two lines are then drawn to give a small space for each case. Each of the two sets of statements is examined separately, and when a statement is known to exist, the number 1 is appended at the upper part; if it is unknown, the number 2 is appended. When the same statement exists in the second case, the number 1 is placed in the second row; if it is unknown whether it exists or not, the number 2 is appended; and if it certainly does not exist in the second case, the number 4 is inserted. The numbers are then added up. If all the added numbers are 2, the two statements are identical. If any one of the added numbers is 3, the statements are only probably the same; and the number of 2s in proportion to the 3s determine the degree of probability. If any number 4 is present, the second assertion is only possibly the same as the first, and the degree of possibility may be in some degree inferred from the proportion of the numbers 2 or 3 to 4. Lastly, if the number 5 is present, the second assertion is not the same as the first.

Example 1. John is the only man who is tall, fat, fair, long-haired, wide-mouthed, has a limp in his gait, and a peculiar squeak in his voice. This morning a woman saw a man steal a leg of mutton, and she did not know his name, but she states that he was tall and fat, his countenance was fair, and his hair streamed over his shoulders. When she looked at him his mouth seemed to stretch from ear to ear.

As he walked he limped in his gait; and when she called after him he squeaked out a terrible oath.—Required to know whether this man was John.

Tall.	Fat.	Fair.	Wide-mouth.	Long-haired.	A Limp.	A squeaking voi	
1	1	1	1	1	1	1	1st Case
1	1	1	1	1	1	1	2nd Case
2	2	2	2	2	2	2	Yes

From the above premisses, the man who took the meat was certainly John.

Example 2. Another person saw a man steal a fowl; he was tall, fat, of a fair complexion, and long-haired, and had a limp in his walk, and that is all the account he could give. In this case, in the second instance, as the existence of the wide mouth and squeaky voice would be unknown, they would be represented by 2, which being added to the 1 of the first case, would be 3, and the answer would be 'Probably.'

Example 3. Supposing we did not know whether the above-recited peculiarities were not common to several men —and we have no other specified peculiarity to distinguish him—then 'other peculiarities' must be added in another column; and as we are ignorant whether they exist or not, the figure 2 must be inserted in the first case; and also if the same want of knowledge existed in the second case, another 2 must be inserted, when, the sum being 4, the answer would be 'Possibly.'

Example 4. Suppose the man observed to commit an offence had a bass voice instead of a squeaky voice, then in

the second case the figure 4 must be inserted opposite to squeaking voice, which being added to 1 would make 5, and the answer would be 'No.'

Human and Divine laws.—There are two modes by which the human mind may be affected, and all our actions regulated to a common purpose; one by the impression of the nervous system by induction from below upwards, that is, from the action on the nerves of sensation through the mind to general laws, and the other from the effect of general laws which act downwards by deduction to the particular instance.

The one by induction is the ordinary result of the natural mind as detailed in this work. The one by deduction is by the reception of the laws of God as given us by religion.

Is religion and reason discordant? No! One effects from above downward, the other from below upward, and if both are right they must agree, they cannot possibly differ. The doctrines of religion would be vain unless they are the laws of God, and the word of God. In like manner, it must be remembered that the inductions of the human mind, if made in sincerity and truth, are equally the result of the mechanism created by God.

Man should therefore accept as a fact that the results of the true reason of man are identical with the laws of God, and the one originating inductively from the human mind should accord deductively with the results which are obtained by the ordinances of religion.

Mentally, if both are right, there can be no disagreement, for whether we examine the question from above downwards or from below upwards, no difference can possibly exist, inasmuch as the mind is one whole. Then why should be therefore these continual differences between the teachers of religion and the teachers of science? At the present time it

is difficult to enter a church without hearing the name of science being held from the pulpit to disrespect; and it is equally difficult to enter the chambers of science without hearing the pastor of religion in a like manner spoken of with dissatisfaction. And why? The pastors of religion are, as a rule, profoundly ignorant of the physical laws which govern the universe, and the teachers of science are equally ignorant of the moral laws which govern the actions of mankind.

For example, to love thy neighbour as thyself is a great Christian doctrine, which is a general law, which should affect every act of ourselves deductively; but to induce that law inductively, a greater experience must have occurred than really could be anticipated by the knowledge of any one man, yet the experiences of all men might be collected into a general law, when it would accord inductively with the results which are derived deductively from the law of Christ.

The fault of the present day is the education of teachers of religion at one school where physical science is not only discarded but ignored, and the education of teachers of science at another school where the laws of religion are almost as equally ignored.

The remedy for this gigantic evil would be to teach all men to a certain extent knowledge in common, so that when they diverge afterwards into their special studies, science shall not be without religion, nor religion without knowledge.

Another remedy for the present unfortunate position of the mind of the age would be for different classes more freely to interchange ideas. The tendency of the period is for society to group together in classes; even the Royal Society for the Promotion of Natural Knowledge is most

exclusive to all but actual followers of natural science. The clergy separate themselves, the doctors congregate together, but a continual intercourse in a right spirit has a tendency to perfect the mind of all; and whether they work in the upper, lower, or middle departments of their minds, all should accord.

The priest trained to the study of the external world and of the natural operations of the human mind, is a totally different man from the priest who ignores knowledge and the effect of reason. The one sees Nature and God as they are, the other only by his own unenlightened mind, which leads many to inconstancy, idolatry, and man-worship.

It is sufficient for every well-meaning member of society to know that the mind is a circle one and indivisible; and, whether affected in one direction by the general laws of God to the particular instance, or in the other from the particular instance to the laws of God, induced therefrom, the effect of our actions would be alike regulated by general laws.

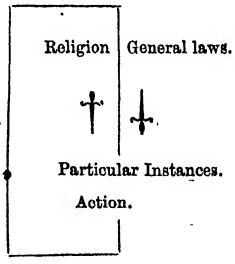


Fig. 10.

Wherever religion and science do not exactly accord the discrepancy marks error. It is then worth any labour to make them agree by the conjoined operations of the labourers in religion and science that truth may prevail.

For the last five-and-forty years I have been a regular attendant at St. Paul's Cathedral, and consequently have heard most of the preachers of mark in the metropolis of this century; it is clear to any rational mind there is error in the pulpit; one affirms, another denies, whilst it is the property of truth ever to remain unchanged, and to stand the test of fair inquiry.

For the last five-and-forty years I have also been mixed up with most of the scientific inquiries of this eventful century, and had constant communications with the pioneers of knowledge. Many have expressed their extreme regret that the teachers of religion should not acquaint themselves with the knowledge which is obtained from the external world by the mind, but should give themselves to fancied deductions and crude imaginations which have no exponents in the external world.

Those who love their church, and view it as an inestimable blessing to mankind, most earnestly wish that the pastors should so discipline their own minds by knowledge that they appeal to the minds of their hearers from the general law to the particular instance, and from the particular instance to the general law, for the teachings of religion and science must be identical when both are true. It is a lamentable fact, but nevertheless one which admits of no contradiction, that religion, as frequently taught in the pulpit, is not the religion of the mass of the congregation of ordinary knowledge and intelligence. Religion is often brought forward in a form positively distasteful to the minds of many. The omnipotence of God, and the importance of His almighty laws, are neglected for human traditions and mediæval superstitions: this very serious position cannot long remain without danger to the community, for reason and religion are one, and cannot be divided; and, above all things, it is of paramount importance that religious teachings, involving as they do the laws of God, should be in every minute particular based on absolute purity and unswerving truth.

Value of the pronoun I.—In the human brain impressions from the external world are continually being received, are there registered, and remain to produce their influence

on the comparison between new and bygone knowledge. As far as the mechanism of the brain exceeds that of any human contrivance, so is the result of the proper application of the mind more trustworthy than the artificial contrivances of reasoning by words, cyphers, or mechanical inventions.

From this cause great respect is paid to any trustworthy person, when he boldly declares that he himself believes that any opinion which he promulgates is true. In writings, therefore, nothing can exceed the value and force of the word *I*, either implied or used; and although there are not found wanting persons who scoff at the pronoun, and attempt to ridicule its use by recounting the number of times per page it occurs as an act of egotism, yet its more abundant employment would have saved the world from much sophistry, deceit, and falsehood.

Almost all untrue statements are based upon arguments by words, and the person who writes them never gives his opinion unequivocally. His arguments by words throw the responsibility of the conclusion on his readers, from the facts which he has recorded; and there is nothing to show how many other facts or parts of facts he has suppressed. But if he makes an assertion of his own belief, his readers have the result of the natural process of thought, if he be but honest and trustworthy.

By avoiding the use of the word *I*, a newspaper editor in America actually conducted two journals of totally opposite politics at the same time. In both cases he showed certain arguments, and the conclusion legitimately deducible from the premisses; but he took care not to include the little word *I*, or, in other words, to show the belief which his own natural process of thought led him to adopt.

In all professional subjects the opinion of the professional person should be obtained. In the case of a lawyer, he should distinctly give his opinion upon the whole facts of the case; so a medical man should be expected to state a definite opinion from all the materials which he can collect upon the subject. It has always been my practice for years, however difficult a case may be on which a report is given, first to state the difficulties of the case, and finish by an opinion as it presents itself to my mind, on all the facts of the case. In giving this opinion, a result is obtained which has been derived from the mind, the immediate work of God. In setting out an argument by words or symbols, a result is obtained by a process of mechanism devised by man.

Evidence and Testimony.—Trials are employed to determine the truth of an accusation against a certain person or persons, that is, whether he or they at a certain place did something which constituted a cause which produced an effect, the whole occurrence having taken place between certain times. This constitutes the charge, for instance, 'John, at No. 1 Peaceful Cottage, beat James, last Monday, at ten o'clock.' For the purpose of ascertaining whether the offence was really committed, a number of witnesses are called, and the evidence which they each received, through the medium of their senses, is recorded. If the images received upon the sensorium of the witnesses, according to their statements, correspond entirely with the images which such a charge should have produced, the guilt of the party is said to be proved by the concurrence.

In carrying this process to the very utmost possible perfection to which the system is capable, every word should be so described that no possibility of wrong interpretation could occur. Then, and only till then, can the statements

of the witnesses, when they express that which they receive upon the brain by symbols or words, be relied upon, and no error be likely to occur from ambiguity. When the sets of words or symbols derived from the witnesses are compared with the words or symbols constituting the charge, and are found to exactly concur, then a mere piece of mechanism would be sufficient to show the guilt of the party.

But we rarely can procure the evidence of witnesses to prove charges in serious offences. The eye of man is shunned at such periods, and thus no one sees the deed, and the entire evidence is scarcely ever procured. In these cases, the guilt of the party must of necessity be one of probability or possibility, as there cannot be an absolute concurrence between the symbols of the evidence and the symbols of the charge. Nevertheless, upon that probability the law has wisely ordained that criminals should be convicted, and expiate their crimes by the highest punishment.

Suppose, for instance, 'John is charged with killing Thomas with a knife, at 1 Miniver Place, at two o'clock on Monday.' In this case, evidence might be adduced that John was there at that time, that John's knife actually killed Thomas, and that John was badly affected towards Thomas, for no one would take the trouble to kill another unless he had a motive. Now, in this instance, the mode of the act of killing would not be proved but from the concurrence in all other particulars, and the total want of disagreement between the charge and the facts proved. John is probably guilty, and the jury would doubtless return such a verdict.

This verdict, however, is only one of high probability, and we must not forget that James, of whom no evidence was given, and against whom no charge was made, might

have taken the knife from John's pocket, killed Thomas, and then put the knife back again, totally unknown to John. There can be no question but that in the annals of English jurisprudence, notwithstanding all its care, innocent persons have fallen victims from probable or possible guilt having been confounded with actual guilt.

The laws of affirmation, negation, possibility, and probability, might be turned with good account to prevent this serious mischief. The accusation might be clearly set out; the evidences of the witnesses might be taken before the jury, who are manifestly the proper persons to assign a right word or symbol to the impression which the witnesses received of the event in question. Having arranged these symbols, one by one, opposite the corresponding symbols of the accusation, my differential machine would describe the possible, probable, or actual guilt of the person accused.

Although I have assumed a criminal case for the purpose of my argument, yet the same reasoning would hold good in every civil case. One man sustains a damage at the hands of a second; the charge is set out, the witnesses give their testimony, and the question of identity between the charge and testimony is one which may be determined by mechanical contrivances when the words in the two instances are accurately set out.

In every case the intervention of the jury is necessary to assign a word to express that which the witness describes, because it would be impossible to obtain witnesses who shall be enabled to declare the particular nervous fibres which were excited when the event occurred. Moreover the examination of every word with such minuteness, would be very tedious, though it might admit of minute investigation. The meaning of every important word should be fully unravelled in every instance.

When the defendant answers a charge, he should, if it be unfounded, admit every circumstance which is true, and deny only the circumstances which are false. By this proceeding, the attention of the jury is likely to be concentrated upon the immediate point in dispute, and thus be enabled carefully to estimate the value of the testimony adduced. By this course, the accused destroys the apparent effect of that high probability which is likely to be produced by an extensive concurrence between the charge and the evidence.

In most cases of testimony the assertions of all the witnesses do not agree. Some give evidence of one kind, some of the opposite, so that the evidence upon the same point is contradictory. In these cases, the laws of induction and deduction are applied by the jury, to judge of the value of the testimony, and that which affords most probability, or that which most coincides with former knowledge, is received.

We thus perceive how imperfect, at best, are our conclusions, even when based upon the most approved evidence. We cannot fail to observe, that however carefully a jury may investigate a case, however unbiassed and unprejudiced they may be, yet, nevertheless, their verdict, in a majority of cases, can only be considered as proving the probability or possibility of the guilt of any person. In every instance the result is obtained by the artificial means afforded by words and language, and we should never forget that wherever words are employed, there errors may creep in.

Quibbling.—The imperfections of logic have been for so many ages employed by mankind for quibbling, deceiving, and leading to wrong conclusions, that we cannot do better than restrain its application to the same derogatory purposes; and instead of showing how, by extraordinary acumen

and a high exercise of mental power, it may serve to a good object, we shall at once describe the usual methods by which it serves for a contrary purpose.

For proving what is false from any given premiss, logic is extremely convenient, as the system does not note with sufficient accuracy the signification of various words, and their mutual relations, unless, indeed, we except any very gross ambiguity in the middle term. A pun consists of good reasoning upon words having one sound or spelling, but two senses. By the natural process of thought, unless the individual is, indeed, exceedingly obtuse, the mind, as soon as the conclusion is brought before it, perceives the joke, and the auditor laughs at the deception, Example, 'John, as you are light you can illuminate this passage.'

Puns, however, are such glaring cases of using apparently the same word in different senses, that a deception could very seldom be practised by them; yet in a less degree errors may certainly arise in that manner.

One great and frequent deception which can be effected under the logical system, is by using a noun in one term, and a qualified noun in a second. But to be successful, the qualification must not be apparent, it must be understood. If I say 'I had a bird for dinner,' then the qualification 'cooked' is understood. The further removed this qualification can be placed from the noun in any argument, and the smaller it is in amount, the more successful is the quibble likely to be. A humorous story is quoted by Professor De Morgan, which is a good example of a transparent quibble of this character. 'A servant who was roasting a stork for his master, was prevailed upon by his sweetheart to cut off a leg for her to eat. When the bird came upon table, the master desired to know what was become of the other leg. The man answered, that storks had never more than

one leg. The master, very angry, but determined to strike his servant dumb before he punished him, took him the next day into the fields, where they saw storks standing, each on one leg, as storks do. The servant turned triumphantly to his master, on which the latter shouted, and the birds put down their other legs and flew away. "Ah, sir," said the servant, "you did not shout to the stork at dinner yesterday; if you had done so, he would have shown his other leg too." '

Another common mode of deception for those who admire that course, is to link two sets of things together; and thus it has happened that when a statement has been made true in all particulars but on some trifling point, a total denial has been given to the whole, and then the auditor was allowed to infer that the whole was not true. Example, 'Are there not persons involved?' Answer, 'No.' It was afterwards discovered that there was one person.

The converse method is frequently employed by unscrupulous counsel in their cross-examination of witnesses, to make a fact appear to the jury contrary to what it really is. For this purpose they ask a question as to a qualified noun, the answer to the noun in its general signification being negative, the qualification positive, or *vice versâ*. For this mode of quibbling, the qualification should be as much concealed as possible. The object of this quibble is so to put a question that a direct answer either way is both partially true and partially false, thus, 'Did you go there soon?' Now either Yes or No would be partially true and partially false, because 'I went there, but not soon.'

The value of logic to deceive or give a wrong inference, by extending or limiting the sense of a word, cannot be overrated. It is so perfect, that probably no well-instructed logician would fail to evolve an argument, and give a totally

different conclusion from that which is correct. On all these occasions the error should be thrown over as many words as possible, that it would become a matter of much labour to discover its exact locality.

The verb is a word upon which the quibble may be turned. In the first place, the substantive character contained in the verb may be altered a little by attenuation or amplification, with precisely the same results as though the quibble had been made by the noun. The quibble may be made by extending or limiting the signification of the time so little that it is scarcely noticeable, and yet the meaning may be greatly altered. At times even the effect which the verb has upon the meaning of the nouns to which it appertains, may be in like manner altered. Whenever we can add or subtract ever so little from the true signification of a word, the meaning may be entirely changed.

A common form of quibble amongst dishonest men is to give an answer inferring a premiss which renders a supposed fact impossible; for instance, when a cardinal was accused of taking an oath to persecute Protestants, he answered to the effect that cardinals were not required to take the oath; and to this day nobody knows whether he took the oath or not. The quibble consists in the value of the proposition, 'Cardinals are not required to take the oath,' for it is possible that cardinals may be excepted, but that he in another capacity took it.

There is a mode of practising mendacity which is immediately apparent. It consists in using two words to signify the same person or thing; one being used in one case, the second in the other, and then the assertion which is made of one is denied of the other. When one priest was reviled for the influence which another exerted on the mind of an old man to cut off the entire fortune from his own children

to bestow it on the priest, he replied that the statement was false, for that his name was not mentioned in the will. The son rejoined, 'No, but the name of the vicar apostolic was:' the vicar apostolic and the priest being at one time the same person.

A telling mode of quibbling is much used by quacks. In this case the quibble is thrown upon causality. They enter into an elaborate argument to prove truly that something undergoes a change, and thus may become a cause; they repeat the argument upon the something which changes and becomes an effect; but the cause and effect have no manner or kind of relation, the cause being the cause of another effect, and the effect the result of another cause.

There is a form of quibbling which is powerful in scurrilous writings; for instance, we may give a man credit for the love of some virtuous action, in doing something which is manifestly not virtuous, and hence, from the result, infer the contrary to that which is expressed. As if we said that A B, no doubt from a love of honesty, religion, and high principle, keeps the money left to the orphan and fatherless, applies the wealth bequeathed to the friends for his own purposes, seizes upon all which he can obtain by law, and not by equity, and makes a merit of giving to charities money which morally belongs to others. The mind is first led to anticipate honesty and high principles; but in the end it discovers moral delinquencies, and the villany of the action is inferred by premisses not given, but intrinsically belonging to it.

A serious quibble in use in this country is the inference of a fraudulent design in the motives of men, and an appeal then to judges in Chancery. It is so telling that judges set aside contracts, reverse acts and lead to extor-

tion, as proverbially to render the courts in the minds of foreigners a terror.

A quibble is sometimes practised by some action, having a definite signification, being used in addition to the words spoken; thus, if a person asks a pew-opener to show him into a seat, and at the same time rattles the money in his pocket, the pew-opener would certainly infer that he was to receive some reward for the performance of his duties; but if the visitor, on gaining a seat, took his hand out again without bestowing the gratuity, doubtless the official would be so much astonished that his devotions for that service would be materially interfered with.

The meaning of a word may be totally altered by mere change of emphasis, and hence this plan is often used for quibbling. The words from the Bible, 'Saddle me the ass, and they saddled him the ass,' may be totally varied in their signification by a change of emphasis on the word *him*.

A fallacy which is frequently employed is, to allow a question of high probability to be inferred as a certainty; and conversely, a question of certainty to be inferred as only one of high probability; as if we said, that John was found guilty of murder, therefore his innocence is impossible. So, also, a possible supposition may be extended into a reality, and many men are ruined by investing money in concerns which are only *possibly* good. A mean in the same way may be used without reference to the variation of the limits; thus a man might be drowned in a river whose mean depth was only one inch, because occasionally it may be six feet deep.

An assurance office might grant annuities upon the assumption that the mean age at which a man died was forty. It turned out that half the persons died before the

age of two, and consequently the remainder died on an average at a higher age. The annuities were granted to persons above two years of age, when the office would necessarily have failed.

In conversation, persons frequently take two sets of words, each having the same meaning, and argue that one is true because the other is, when, in reality, neither is true. Thus 'John is a tall man,' because he is a person of considerable height. By this mode of quibbling the mind is thrown off from the manner in which information was obtained of his height, and the probable value of that assertion. This is called circular quibbling.

People are often thrown off their guard by being asked a reason for that which is not true, and by which they are led to infer that a falsity is true. Example, 'How can lead be turned to gold?' To answer the question centuries were spent in attempting the conversion. The question involved the understood premiss, that lead is convertible into gold.

Conversely, persons are deceived by reasoning upon that which can be reduced to a matter of fact.

One of the most certain of all forms of quibbling is to describe the same thing by a totally different word. In this way the greater part of Paganism has been handed down under the much-abused name of Christianity.

By a variation in punctuation a complete subversion of the meaning of words may be produced. At various times I have met with curious exemplifications of the possible mode of quibbling by a variation in the punctuation; and once a person actually told me that he never punctuated his letters, that he might make them read in various ways if that course should be required. The fear of the effect of any punctuation is so great, that legal documents are never stopped.

Sometimes quibbles turn upon assuming a conclusion as proved, which is termed begging the question; and at other times the mind is distracted by a second person answering away from the main point, which is an evasion of the question. By skilful quibblers both these modes may be rendered sufficiently effective to deceive others.

There is a form of quibble much practised by senators and other great men. They give a right conclusion, but conceal, increase, or alter, the whole or a part of the premisses from which the conclusion has been drawn. I admit the necessity of keeping back facts at certain times, but fearing the danger of any kind of quibble, it appears to me, that a man in power should have the option of submitting or concealing the facts, rather than that he should be compelled to resort to any form of untruth whatsoever, even for the benefit of the state.

By introducing hypothetical facts amongst direct assertions, an inference may be given to the mind of a second party that such fact exists, or that there are good reasons to believe the possibility of the fact. Example:—He is a good lawyer, a clever man, a person of great industry and ability, and will be admirably adapted for your purpose *if he is honest*. By this quibble the man's honesty and general character are questioned.

There is a quibble used by controversial writers, as they frequently contrive to throw the quibble upon the value of an authority; thus the author must be wrong because Hunter says differently. This assertion involves the false premiss, that everything which Hunter says is right.

It not unfrequently happens that persons quibble by denying the desire to do a particular act while they are actually engaged upon it: thus, 'I do not wish to be guilty

of the bad taste of praising my own piece of sculpture; but yet, when I examine the charming proportion of its parts, and the beauty of its finish, truth compels me to declare that there never was any piece of work equal to it.'

The multitudinous quibble is generally practised by our Transatlantic brethren in the formation of companies. They state a general fact in a prospectus, and then support it by various statements in newspapers, letters, &c., so that they get a combination of statements all tending to one conclusion. It is practically found that very few persons have mental power sufficient to withstand the combined and reiterated assertions of a number of people all varying in their statements, but yet tending to the same end.

A rather refined quibble is occasionally practised by taking advantage of some abnormal state of the second party, when he is not likely to see things in their true light.

It has now been shown how man can deceive his fellow-creatures by the use of that artificial system of words and language, the power to use which has alone been bestowed upon human beings. No matter how voluminous an argument may be—no matter how the truth or falsehood may be involved, a man may always be put upon his veracity in any statement he may make, by asking him, 'Do you of your conscience believe your assertion to be correct and calculated to lead to a right inference?' By this question you throw the difficulty from the work of man in his imperfect artificial mechanism of words, to that work of Nature from which emanates the mind. In obedience to this recommendation, I do declare, that this work, and my treatises on which it is founded, contain, to the best of my belief, correct and true deductions from all the facts which I have been able to collect upon the structure and the mode of arrangement of

the nervous system on the one hand, and the observed functions on the other; and I feel assured that the whole system is one fairly based upon the observation of nature.

The use of words and language is designed especially to communicate our ideas and thoughts from one to another, rather than for the purpose of our own individual judgment. Probably no great discovery was ever made by reasoning by words, but contrariwise by the pure and natural operation of the mind. Some who have made discoveries are slow even to explain them by words, and much less proficient to detail the train of thought by which they arrived at their conclusions. Amongst the more noble efforts of thought upon purely material questions, the properties of numbers, and the science of arithmetic; the sciences of trigonometry and geometry; the laws of the motions of celestial bodies; the laws of the relations of the physical forces, and the laws of chemical combination, are the most important which have as yet been developed.

These have been thought out by the mind after the facts in nature had been carefully noted and registered in the brain. All these inductions involve the higher departments of the mind; and as the laws have been made on all the facts of the case, they involve the consideration of all human knowledge.

Having all the facts upon a case duly implanted in a healthy brain the mind may come to an instantaneous conclusion. From the natural inferiority of words and language, and their inferiority to the natural process of thought, it would be tedious if not impossible so to set out a case by words that a comprehensive law should be developed. Even when developed it is difficult—very difficult—so to explain the train of thought as to render it thoroughly

intelligible to a second person, whilst it is so tedious that very few persons dare venture to attempt it.

From these considerations we should restrict the use of words and language to their true and proper application,—the communication of facts and thoughts from one person to another.

When a train of ideas is derived from the external world by the mind, their bearing from the general law to the particular instance, and their relation to other trains of ideas, present themselves to the mind the moment they are appreciated, and when the mind is active and healthy all the bearings of a case are perceived with vividness. When a train of ideas have to be communicated by words and language, it is difficult to present them as a whole at one moment, they have to be presented piecemeal.

In the city of London, amongst the higher classes of commercial men, a distinguished barrister—Mr. William Cracroft Fooks, now a Queen's counsel—commanded great admiration from the extreme skill with which he drew complicated deeds. One day, on being in consultation, I ventured to allude to his acknowledged skill, and told him that his deeds evidently showed the marks of design; and I asked him if he would favour me with the general plan in his own mind by which he prepared those documents which had so delighted and astonished the mercantile community.

He said that it was easy: that he extracted from all the materials sent to him in any particular case the general affirmative,—that formed the substance of the deed. Then he collected the exceptions logically and in order, then the provisos, and lastly the qualifications. Whilst it was of the utmost importance to collect the general affirmative, yet he had to study the effect to be produced on the mind of a

second person by the general arrangement of the events, and thus it was of great importance to collect all affirmative propositions, or rather to collect every part of the case to an affirmative statement.

CHAPTER X.

RELATION OF MIND TO GOD.

Argument of design—Fixity of laws of nature — Fixity of moral laws — Effect of prayer—Power of prayer—Nature of matter — Origin of matter—Creation of the universe—Omnipresence of the Deity—His Omniscience — His Omnipotence.

THE various ideas which appear to the mind spontaneously by its natural operations have been already discussed; and it has been demonstrated that in a normal state of mind the idea of an infinite future state of good and evil, and of an infinite Power, is ever before the human mind; but it now remains to consider how the relation of the material world to the immaterial may be also deduced from formal reasoning by words and language.

The exquisite adaptation of all things to their purposes throughout all the works of Nature has led Paley to the adoption of the argument that every design must have had a designer, and that when an intricate piece of mechanism is presented for examination, where every portion has its appropriate design for a purpose, that a constructor must be inferred. Reasoning from the mechanism of a watch to the more complicated organisation of living beings, Paley was

led to infer that the phenomena they exhibited proved the existence of an Omnipotent Power, who designed and created the universe. This argument was followed by a series of discourses called the 'Bridgewater Treatises.' Without attempting to deny the importance of the conclusion of the existence of the Creator of the universe from the perfection of design shown in His works, it appeared to me that a formal argument may be derived from the nature of every material event.

If there is one prominent fact impressed upon the mind by a study of the works of Nature, it is the fixity of the laws upon which the universe is governed. Everything runs its prescribed course, and appears not to have any direct interference by the Creator of all things.

The general tenour of the beautiful Book of Psalms is to infer that God does immediately interfere in the course of the universe either for the benefit of the good or the punishment of the bad. Nevertheless it is constantly stated how the people unheeded His laws, really as though they did not believe this direct and special interference with the course of events.

When we carefully and critically examine the events which happen around us it is impossible to come to any other conclusion than that human operations are subject to moral laws as certain as those which appertain to matter. Have not those laws existed from the creation of matter, and do they not affect a single person or a nation for good or for evil on this great earth, as surely as the light and warmth of the sun promote vegetation, and will they not in the future lead to infinite enduring pleasure, and infinite enduring pain?

The question now before us is the population of the world governed by moral laws, designed by God, coequal

with the appearance of man or even of matter, or is there constant interference with or suspension of natural operations? The answer by any intelligent, watchful mind, must be that moral laws as well as physical laws have been ordained from the beginning and are immutable.

The doctrine of the direct interference of Providence in the details of human affairs has been enforced by designing men and turned to account as a political engine to rule mankind and govern princes. On the assumption of this direct interference they have claimed power from God to cause the Almighty to suspend the operations of His Almighty laws at their particular desires. Upon the faith of this claim they have ruled potentates and kingdoms, drawn to themselves the contributions of individuals and the property of families; and those who believed in the laws of God and disbelieved these pretenders have been subjected to injury; and in the annals of history, the sacerdotal rule has led to persecution, torture, and death of untold thousands under the mask of religion.

For this reason some men, learned in many sciences, have called in question the efficacy of prayer to alter the natural course of events. These men argue that because God governs the world by immutable laws, He heeds not prayer.

Experience shows that the direct course of the affairs of the universe is not interrupted by prayer: the sun never reversed its course in consequence of prayer; nor did any person rise contrary to gravity from one floor to another by praying.

But a study of the human mind indicates that in all human actions prayers have great effect in governing men's actions, and leading to results. When a man prays with earnestness and sincerity it affects his whole mind, and all his actions are directed to obtain the result for which he

prays. When many men pray for one object, the purpose of many persons is directed to one end, and all combine in heart and will to obtain the desired object.

The influence of prayer on human actions, if tested by experience, will be found to be immense. In producing resignation, and in confirming action, its power is great, although its influence to control the laws of the universe is void and of no effect.

If every action is governed by moral laws, the result of any act would have been preordained hundreds of millions of years ago, and the provision for every act of man under every surrounding circumstance would have required as high an act of Creative Power, as the formation of the universe on fixed laws.

It by no means follows because the consequences of any act in relation to its surrounding circumstances have been preordained from all time, that any man has been predestined to that result. On the contrary, all human experience is opposed to such a notion, and indicates that the mind is regulated by its experiences, and governing moral laws, and that the result is determined therefrom. The doctrine of preordination leads to thought, activity, and dependence on the moral law, whilst the doctrine of predestination leads to indolence, recklessness, and a total neglect of the ordinances of God.

All physical phenomena and physical forces are traceable to atoms of matter which have a property of acting on each other by the power of attraction.

Having traced the manner in which the material universe is composed of atoms, or ultimate particles, to which we give the name matter, and that the term matter is given to whatever attracts, the mind of man is naturally led to consider how and from what cause matter attracts, and by

that attraction produces all the varied phenomena observed in the physical world.

The first question that naturally suggests itself to the mind that attempts this investigation, is the probability which is given to the attachment of some imponderable or essence to matter, by virtue of which attachment, the power to attract is bestowed on material particles. Such a question appears to be answered without much depth or profundity of reasoning, for if matter exerted attraction by virtue of some principle, essence, or imponderable attached to it, then would that principle exert attraction without matter, or at least we cannot perceive why it should not exert that property.

From the general views that are forced upon us by our present mode of studying physical phenomena, we must assume that attraction was first exerted before new attractions could produce the effects of electricity, galvanism, heat, light, sound, &c. As attraction must have preceded the greater number of physical phenomena, we may also presume, or, in fact, we must admit, that attraction itself had a commencement. And the idea of time, we have already shown, is derived from an old attraction resisting a new one acting upon it. Each event, consequently, must have a commencement and a termination. To increase the number of these events will not assist us, for, how far soever we carry back the events, still their character is immutable; there must have been one event which was prior to all others, and that first event must have had a beginning.

The beginning of the first event affecting matter was the primary attraction, which the subsequent attraction sought to disturb; and the great question which the human mind desires to speculate upon, is the cause of this first exertion of attraction.

The first exertion of attraction, probably, did not arise from any principle attached to matter; but still, even if it owed its power of attraction to an imponderable, the cause of the imponderable attaching itself to matter would be the obscure point on which the human mind delights to contemplate; for the first exertion of attraction, however arising, would alone give to matter its material properties, or, in fact, there would not have been matter (according as we define matter) without the capacity of its particles to set up attraction.

This power of matter to generate attraction in the first instance could never have arisen from anything inherent, we therefore are compelled to admit that from something extraneous it derived its power. If we look at the means necessary to endow matter with the property of attraction we are instantly astonished at the unbounded magnitude, magnipotence, and magnipresence of that power; for we have evidence to show that that power was evinced over enormous masses of matter, separated by hundreds of thousands of millions of miles. If that power is continually being exerted the author necessarily appears as the governor of material phenomena; but if the government of the world is continually being affected, we discover that no variation has taken place in the general properties evinced by matter since the world began; the earth still continues to run its daily and yearly course; matter continues to be hot, illuminated, and capable of causing sound when acted on in a peculiar manner; and, as far as we can learn, not the slightest alteration has occurred since the earliest human event was recorded.

Whether that power was, in the first instance, implanted for once and for ever, or, whether by a continuance of the exertion of that power, matter continues to attract, are subjects for contemplation far beyond the capacity of human

intellect to deduce from physical phenomena. We can only admit that the same power which first caused matter to attract, may also cause, at any given moment, that phenomenon to cease.

To the source of that immensity of power, which we see either has been exerted once, or which continues to be exerted, we attach the name of the Creator, or Almighty.

The attributes of the Creator of all material particles naturally form a subject of the most sublime contemplation for all beings endowed with reason sufficient for that purpose. But here, again, we must refer to our incapacity to enter into a subject so much beyond human understanding, for man can only appreciate things which are material, and which, by virtue of their properties, communicate impressions through material organs to the human mind. We find that we cannot determine the absolute attributes of the Deity from physical science, but only infer certain attributes by not attributing to His divinity the properties of matter, which solely derives its properties through the exertion of His power. In fact, nothing is more erroneous than the comparison of perfections in God with natural qualities in man. Out of this have arisen incalculable mistakes.

If we review the properties of matter we find that its first property is number, that the juxtaposition of units forms addition and multiplication, and the mass of matter so formed is susceptible of diminution and division. The material character of number forbids us to attach that property to the attributes of the Almighty, for His attributes are clearly immaterial, having no connexion with the properties which His mighty power caused matter to evince. Natural philosophy, therefore, teaches us that the Almighty has no relation to number; that, consequently, He is indivisible, and incapable of addition. For ages the great-

est disputes have arisen, and schisms and heresies sprung up throughout Christian communities, by attributing the properties of number to the Deity, and conferring material virtues on the Almighty. It is equally incorrect to attach unity as plurality to His indivisibility, for unity infers a possibility of plurality, and therefore a possibility of being amenable to number, which property matter solely derives from the will of the Creator.

As we must discard the very idea of number as being an attribute of God, so must we also deny the possibility of any attribute arising from attracted number. We cannot therefore give to His majesty form or size, for these are properties of His created matter. His presence, moreover, cannot be limited to one spot, for, position is a material effect. He must extend over space, and consequently omnipresence must be a characteristic attribute of His greatness.

His omnipresence cannot be interfered with by the presence, in certain positions, of created matter. Impenetrability is a property of matter, perhaps by virtue of attraction, and therefore cannot interfere with the Immaterial. The omnipresence of the Deity will not be prevented by attracted matter; but He must be present in the structure of the hardest stones, the most massy rocks; in fact, throughout the matter of this great globe, and even throughout the matter existing over the universe.

The phenomena of electricity, of galvanism, of motion, are in similar manner material actions, which alone have their existence by virtue of attraction. The immaterial character of the Almighty forbids these phenomena to be attached to His attributes; indeed, we scarcely imagine how the Deity, whose attribute is omnipresence, can have the property of motion.

As the material character of the preceding properties forbids their assumption as an attribute of the Creator, so are we compelled to deny the possibility of time, with its dependencies, to be a phenomenon to which the Author of that time should be amenable. The Almighty consequently could have no beginning, no end. Eternity is His distinguishing attribute; and time can have none,—no, not even the feeblest quality of eternity. Time, however exaggeratedly it may be increased, never becomes eternity; for time is made up of a series of events, each having a beginning and an end. Eternity is not made up of events, and has therefore no beginning, no end.

The actions called heat, light, and sound, are similarly material, appertaining to particles of matter alone. The Maker of all things cannot therefore be supposed to be subject to phenomena which exist by His Almighty fiat.

We have thus seen, that whilst all the properties of matter are strictly material, so the attributes of the immaterial are purely immaterial. Science, therefore, directs us to attach materiality to the material, immateriality to the immaterial; and by no means at any time, under any circumstance, to confound the properties of matter with the attributes of the immaterial, or the attributes of the immaterial with the properties of matter.

It is, then, the property of matter to attract, and by virtue of that attraction to yield number, size, form, duration. It is the attribute of the immaterial not to yield number, to be omnipresent and eternal. Matter attracts by virtue of power conferred upon it by the immaterial. Matter is matter by the volition of the Creator.

And we speak of volition. Is not volition a human, and therefore material quality, and consequently a word inappropriate for the attribute of the Almighty? Words are

wanting to designate the attributes of God; and so whenever we use words for this purpose, they must be understood in a sense having no relation to material qualities.

The power which conferred attraction on matter is present not only where matter is, but even where matter is not, inasmuch as position is a material phenomenon. In consequence of that omnipresence, we may infer that He is cognizant of every alteration of each respective particle of matter, which omnicognizance is called the omniscience of the Deity. Our material bodies allow certain impressions to be carried to the mind through certain material organs called the senses, and therefore we only appreciate those impressions which act upon those senses. His omnipresence must know every single change, without respect to any material conditions. His omniscience cannot be interfered with by darkness, quiescence, or temperature. Darkness is no darkness with Him; the stillness of an action cannot cause it to be hid from His observation. His omniscience is derived from omnipresence, not from the properties of matter from which man derives his knowledge.

We, therefore, are compelled to admit and believe, that matter owes its properties to a power conferred upon it by the omnipresent, omnipotent, omniscient, eternal Creator, who first by His Almighty fiat commanded matter to attract, and who, by the same Almighty fiat, may at any instant will attraction to cease, when worlds would end, when time would be no more. As far as regards all material properties, He must have absolute power. At any moment He may dissolve the earth, the sun, the moon, the stars, and as instantaneously summon their particles to assume new shapes, to occupy new positions. This infinite power, or omnipotence, is totally of a different character from our power, which is derived from the properties of matter. Man's boasted power is derived

from availing himself of attraction. The Deity can control that property, and from that we infer the attribute of omnipotence.

It is useless to conceal that these great and glorious perfections are quite incomprehensible to our senses; we can only appreciate material impressions; all else is quite incomprehensible to our mind. To say that God has no relation to number is as unintelligible as His omnipresence, His omniscience, or His eternity. We cannot conceive the nature of such attributes, though we are compelled to believe them, because we cannot conceive that such attributes should not exist.

What positive attributes belong to the Almighty we are incapable of ascertaining by physical science; and even the contemplation of His immateriality will suffice to fill our minds with an amazement, productive of reverence, submission, and humility.

Man in his present condition has not the power of communicating with the immaterial, for man has not the mechanism for such a purpose. Matter can only be affected by matter, and man is not competent to have direct relation with spirit so long as he retains the material mechanism of his body.

CHAPTER XI.

RELATION OF THE MIND TO RELIGIOUS THOUGHT.

Influence of religious thought—Influence of the Deity—Of idolatry—Of moral laws—Spurious teachings—Necessity for the eradication of heathenism — Different appreciation of religion — Danger of the period—Religion and mental phenomena—Physical and moral laws —Difficult cases—Exact definition of physical laws—Want of definition of moral laws—Necessity for prudent action—Indications of future action.

In our examination of the properties of the mind we have observed the paramount importance of religious thought in governing the actions of mankind. It exercises the most powerful influence over every idea existing in the mind, and when true most beneficially regulates our conduct, but when false prejudicially impairs our actions.

We have already discovered that religious thought and mental thought are one. Religious thought acts chiefly from above downwards, from the general law to the particular instance; and mental thought from below upwards, from the particular instance to the general law. In their passage through the various faculties of the mind both should absolutely concur, for if there is any difference

error is marked either in religion, or in reason, or in both, which demands immediate rectification.

In the first place, reason proves and religion declares that it is of the very highest degree important to assign to the material material qualities, and to the immaterial immaterial attributes, so that at no time under any circumstances should one in the remotest manner be confounded with the other.

The first element of pure religion is the idea of the Almighty. He is ever before our minds, and the idea of His power by virtue of His infinity and immateriality should have an influence on all our actions.

This great primary truth which overgoverns all our thoughts, all our ideas, and all our actions, has not that hold at the present time over the minds of men which its infinite importance demands.

Not but man is deeply impressed by his natural reason on the contemplation of the beneficence and power of the Almighty, although his mind is too often distracted by lesser ideas from the great primary religious fact that God is the Author of all things.

With this overwhelming fact before our minds it is singular that the teachers of religion should so constantly and persistently neglect the teachings of the attributes of the Deity to the people, for scarcely one of a thousand discourses from the pulpit has the slightest reference to this prominent and primary religious idea, upon which every other religious teaching should depend.

In the appreciation of the glorious attributes of the Almighty, reason on the one hand and religion on the other concur, and no religion can approach purity without a thorough coincidence between the ideas of God taught by religion with those deduced by the mind.

It evidently requires the higher powers of mind to be properly exercised and duly taught to rightly appreciate the Majesty of the infinite Creator, for men in all ages have been prone to fall away from the true belief in the immaterial which only appears before the mind on earnest contemplation, for the idea of some material object or idol which they can see and feel.

Whenever an idol is set up for worship, whether it be a man, a woman, a brute beast, or an image, the ideas from religion and reason cannot concur, and there is a conflict of thought. The mind is debased and distracted, and religion has not that due control over the actions of man, and ceases to be affective, or at any rate acts to a much less extent as a regulator of action.

Unless the attributes of God are rightly appreciated it is impossible that the laws of God can take a proper hold on the mind. A thoughtful man sees God from His glorious works from below upwards in his mind till he attains the idea of infinity, and so contrariwise, he can never hear the name of the Almighty without perceiving in his mind the operations of His omnipotence as existing in His works.

Religion should declare the works of God and the laws which govern the universe. 'The heavens declare the glory of God, and the firmament showeth His handywork.'

The mind cannot in the feeblest way even realise the idea of the attributes of the Creator without dwelling at the same time on the perfection of His created work. The relation of the Creator to the creature, of the creature to the Creator, must appear simultaneous from the cause to the effect, and from the effect to the cause, in the natural operation of thought.

As a defect of the period, it is not only the custom when the teachers of religion allude to the Creator to take no

notice of the created, but as a frequent and ill-advised practice they speak in no very measured terms against all those men who seek the laws of God from His created works.

Great mischief is done by this course of misdirected teaching, for the mind is diverted from the idea of the fixity of the physical laws of the universe, and is led to all sorts of fanciful imaginations, which allow the unwisely taught to fall into the most ignorant errors.

Not only are the laws of God by which the universe is governed of importance in the consideration of religious thought, but also of similar importance are those moral laws of God which govern the actions of mankind and serve as our rule of conduct one towards another.

A moral law is like a physical law, a law of God, and thus when a man is taught a moral law it should affect the mind in the same way from the general law to the particular instance till it regulates his actions, and his experiences should accord in all parts of his mind with the effect of this infinite moral law, and both should be identically the same throughout his entire thoughts.

It is deeply to be deplored that as a matter of policy the moral law handed down to us was intermingled in the early ages with heathen doctrines, and the true God which St. Paul preached unto his hearers has been to a great extent neglected for superstitions and idolatries.

It is more to be deplored that instead of teaching the moral law as the law of God, and consequently as an effective regulator of all the actions of man, the pretended teachers of the moral law have for centuries sought to turn it to account for their own personal rule of mankind and their self-aggrandisement, that they might make all kings bow before them, and keep the minds of men under their abject subjection.

With this view they have constantly threatened men with insanity in this world and eternal punishment in the next for disobedience to their injunctions, and have freely taken money on the pretence of securing a place in heaven for their souls. All this is the remnant of heathenism, which has never been eradicated from pure religion, and which now must give way before the concurrence of the laws of God with laws derived from true reason.

Religion should now be restored to its pristine purity. Every form of heathenism which has been so powerfully denounced in the Holy Scriptures must be eradicated from our faith, and men must seek in earnestness and truthfulness the physical and moral laws of God not only by their minds from the particular instance, but from religion by general laws.

The position of individuals in society, their usual avocations, their opportunity of observing the works of nature, and the mode in which they employ their minds, determine to some extent the details of their religious belief. In this country the gentry belong to the Established Church; the smaller shopkeepers are chiefly Dissenters; many scientific men have but little religious belief; but the industrial classes as a whole, follow outwardly no religion at all, though it has been observed in many persons, especially in those who are exposed to great perils, that there is a high sense of religious awe, and deep reliance in the omnipotence of God.

My mind has ever attributed these differences of religious thought to the conflict of reason which occurs between thoughts derived from ordinary experiences and the teaching of religion.

Every falsity in religion leads directly to infidelity, and to the negation of all religion, because every falsity creates a direct antagonism between religion and spontaneous

thought. Many pastors make infidels: so great is the responsibility of those who teach superstition and error instead of the physical and moral laws of God.

Many of the leading doctrines of religion, such as that of the omnipotent God, of heaven and hell, and many of the leading doctrines of the moral law, are so firmly implanted in the minds of most men, that there is but little difficulty in perceiving the coincidence of religion with reason.

Contrariwise, the worship of matter or the persecution of men is so discordant with reason, that there should be no difficulty in rejecting any form of false religion involving material or idolatrous worship.

But all religious doctrines are not so plainly right or wrong that they can either be accepted or rejected at once. Many must be held for a time, *sub judice*, and taught with caution and humility, and not by arrogance and assumption; so that gradually, by thought and reflection, our actions may be governed by laws taught us, not only by religion, but by thoughts originated by the ordinary operations of our minds.

The danger of the present day arising from the want of personal knowledge and experience of our pastors, has been already indicated in this work. It has distressed the minds of our philosophers; it has alienated the minds of our mechanics and industrial classes; and those who appear to follow doctrines do not do so by an intelligent appreciation of the subject, but as a kind of fashionable recreation, to serve as a sensational variety from the debased amusements and degraded literature of the day.

Pure religion, in accordance with the physical and moral laws of God, is the antidote to the spurious religion of the heathen which has been handed down from the past.

Everybody should admit the immense power of true

religion over every thought and action, and everybody should seek with all his heart and mind to establish each law of God in accordance with religion and reason, that every doctrine taught should influence the mind of every rational man.

It is of high importance that we should not believe any doctrine of faith which we cannot accept by reason. When faith and reason accord, the mind is strengthened and improved by the religious idea; but if any article of faith is received which does not accord with pure reason, the mind is unsettled and impaired, and liable to receive other false articles of faith.

Some faiths and pretended religious beliefs are so outrageous, that in some cases it is not easy to know whether a person has received an idea from others, or has formed it in his mind as an insane idea.

Other faiths are so manifestly designed for gain, that the parties holding them should not be met by serious argument, but placed under the supervision of the police, to protect mankind from their operations.

Strength of mind can only be obtained by pure religion and true reason, and he is an enemy to mankind who in any way teaches anything which is false to his fellows.

If we could but perceive every department of the mind of a man influenced by pure religion and true reason, we should find that every action would be regulated by a mind having a perfect unity; and whether the general law influenced the particular instance, or the particular instance led to the appreciation of the general law, the ideas produced would be single, and there would be neither doubt nor hesitation, and every person would be influenced by the powerful force of the consciousness of truth. Happy would

be the man in such a case, and well might he exclaim, 'Give me true perception and knowledge.'

During the last century the physical laws of God have been defined with an increasing exactness, but the moral laws during the same period have received little or no contribution to exact definition.

In the complex cases presented to us in action, it is by no means easy to follow what is right or to neglect what is wrong. As an example: I was much struck on consulting a lawyer, high in position in the City of London, as to the action to be taken under a complex state of circumstances to be told. 'I cannot say what the Judges will consider right or what they will consider wrong, I can only advise you well to consider all the facts of the case, and determine for yourself what you consider right and what you consider wrong, and then to act upon it. In the long run, your thoughts of right and wrong will command the support of the Courts of Law and of Chancery, but what will be considered right in the complicated circumstances that you have submitted to me nobody can tell.' But under any defined circumstances, are there not in the moral law principles as certain to guide our operations to that which is right, as there are in physical laws laws to guide our action to obtain physical results?

In every-day life difficult and complex cases arise, which have to be dealt with instantaneously; when, unless the laws appertaining to these circumstances have been previously considered, our choice of action is an operation of mere chance, and as likely to be wrong as right.

Perhaps one of the most difficult cases of this character would be found in the following combination. A man is sworn to secresy; he is questioned as to his knowledge of a fact. His answer must be either yes, no, or a refusal to

answer the question. If he refuses to answer the question he discloses, by inference contrary to his oath, the answer. If he says yes, it is a falsehood. If he says no, he says truly, but violates his oath. How is he to act? I have submitted this case, which is really not uncommon, to many thoughtful persons, but could never get a further answer than that they trusted they might never be placed in so awful a position. My mind is unable to solve the difficulty.

Now the teachers of religion ought to bring all the moral laws of God into the same subjection and perfect application as the teachers of science develope the physical laws, that they may be available by the mind for every purpose for which a law is applicable.

Every good follower of religion must admit that the time which ought to be spent in the elucidation of the moral laws of God to regulate actions, is frequently spent in discussions of the propriety of frivolous garments or the vain conduct of idle ceremonies, and on the discourse on vain superstitions, till those who pretend to be teachers show that they ought to be taught, as they bring doctrines of religion into contempt.

The time has arrived when religion will rule by reason, and reason will be ruled by religion. If the same amount of thought during the next fifty years be bestowed on the exact definition of the laws which ought to govern our actions as has been bestowed during the last fifty years, in defining exactly the physical laws which govern the universe, religion will take its proper position in the mind of man, and we shall no longer be puzzled as to what is right and as to what is wrong, no more than we are puzzled at the present time as to the effect of the laws of the universe in any particular case presented to our adjudication.

There is less a want of desire in the present day to do

right, than an absence of knowledge how to do it. One of the greatest dangers that we can possibly be exposed is to do wrong that we may appear before the world to do right; and it is really a very serious matter to be associated in action with any man who is afraid to do right, for fear he may be thought by the world to do wrong.

With this desire to do right, it behoves us all to bestow our utmost attention to develope the laws of human action. All men desire it, and there is no obstacle but superstition and ignorance to prevent the progression of these pure principles of religion.

Perhaps there is no class of men who more earnestly desire to do right than our judges. They pride themselves on their strict impartiality, and do everything in their power to do absolute justice. Yet how often are their decisions reversed! What is right is wrong before another. What is right to-day is wrong to-morrow; and how often a disagreement occurs between several, when a case is submitted to their conjoined wisdom. The remedy for this is to have their minds thoroughly imbued with the principles which should govern every case, as the mathematician has laws in his mind when he calculates the time of an eclipse, which has occurred in a period which is past, or which may occur in some time in the future.

The present position requires great circumspection and prudence. It is desirable that the scholastic teachers of religion should bestow their utmost thought on the great questions at issue, and that the people shall assist them in their arduous labours. The clergy are not inferior to other persons in general training and capacity, and are vastly superior to them in their knowledge of words and language. They only want to be thoroughly released from the trammels of insincerity and superstition, to be as great pioneers of

action in the moral world as our philosophers have been in the physical; so that every act of our laws, whether physical or moral, may be in the strictest accordance with the laws of God.

We must bear at the present time with our imperfect knowledge of the moral law, but we must look forward with hope and faith that the mind of man, by the reason given to us by God, may give us sure laws to guide our actions. Indications from the east and also from the west reveal that there is a steadfast desire for pure religion; and if it be diligently and truthfully sought, it will surely be found.

Great changes in the inner thoughts of men are taking place. Whether the coming reformation and withdrawal of all which is evil and impure in doctrine will slowly but surely enthrone true religion in the affections of men, or whether the abolition of all which is superstitious and idolatrous will occur by a violent disruption of the present state of society, time alone can reveal. Popular opinion is ripe for either course.

Within this century God has given, to our comfort and benefit, a great accession to the knowledge of His laws by which the universe is governed; and we may trust that He who has given this good knowledge may vouchsafe further a right understanding of the moral laws, that pure religion may rule our minds and regulate our actions to our unspeakable happiness for all time to come.

Religion now must have its influence upon reason, and guide our thoughts to bring into relation the laws of the universe induced by the mind of man, and reason must also lend her aid to scrutinise minutely the teachings of religion. If both these objects are conducted in the spirit of truth, both must be found to accord in every substantial particular. But the very infirmities even of words

and language alone may cause us to suspect error both in scientific reason and religious teachings. To eliminate this error should be the desire of every honest and truthful man. When, however, our laws of reason and religion accord,—when each particular instance is in harmony with our laws, then shall we have a basis upon which to test those particular ideas which now appear to be in discordance with either religion or reason. Reason and religion will then confirm a sure faith; all ideas contrary to reason and religion will be discarded from our philosophies. The moral laws will be as much a necessity for our actions towards each other as the laws of gravity and of physical science are a guide to our engineers. The great result of all this perfection will be to give to matter its material qualities and to assign to the immaterial its immaterial attributes.

As a consequence every form of idolatry will be thoroughly abolished from our hearts and the true God will be ever before our minds.

Let us then verify both ends of the scale of our minds. Let us rigidly examine every particular instance and scrutinise each general law, that we may throw out from our mind, and discard from our faith, every idea which is not consonant with the revelation of God from reason, and a similar revelation of the laws of God by religion and the moral law.

There is probably on a thorough examination of the laws of reason and religion much which is good for us to adopt, and but little which is wrong for us to discard.

The influence of prayer on the mind has already been described in a former chapter, and it has been shown that the object sought must be in accordance with the general and moral laws of God, or prayer is ineffective. It is

doubtful whether any person ever offers prayer for any purpose involving a great violation of either general or moral laws; it would so discord with his whole mind to prevent his utterance. The great master of the human mind, Shakespeare, seems to imply this when he says,—

> 'One cried, God bless us! and Amen, the other.
>
> * * * * *
>
> But wherefore could I not pronounce Amen?
> I had most need of blessing, and Amen
> Stuck in my throat.'—*Macbeth*, Act ii.

Prayer, therefore, is only likely to be improperly employed in asking for aid in cases where we are sufficiently supplied with means to help ourselves, and where its employment is not calculated to give any violent shock to our reason, but rather to enforce the idea of our complete dependence on the immutable and perfect laws of God.

Praise, however, is scarcely liable even to such improper use of prayer, and has similar beneficial results on the mind. Praise acknowledges the infinite first Cause; and when we utter our song of praise, the mind is powerfully affected, from the highest general laws to the smallest particular instance, and reflected backwards from every single idea through all our abstract ideas, to those of totality or infinity, on which all our higher religious thoughts depend.

Let us then utter our songs of praise for the greater blessings we receive through the higher powers of the mind, to the blessings of the single ideas which are immediately derived through our organs of sensation.

Continual and daily praise increases our pleasures and intensifies our joys. It diminishes our pain by bringing most powerfully before the mind the mercies which everyone receives, and proves that our very troubles are gains. It

lessens our woes, by giving us comfort in the thought of the goodness and greatness of God, and confers upon the mind the highest pleasure, by an exercise of one of the noblest of all human feeling, gratitude.

> 'He that is ungrateful has no guilt but one,
> All other crimes may pass for virtues in him.'—YOUNG.

CHAPTER XII.

RELATION OF THE MIND TO MORAL PHILOSOPHY.

Action of one man to another—Right and wrong—Moral law the law of God — Truth — Absolute Truth—Moral law universal—Particular moral laws—Duty—Necessity for more exactness of moral laws—Mode of proceeding of medical men—Of lawyers—Improved mode of thought of clergy.

REASON teaches the laws of God from inductions from particular instances, religion teaches the laws of God and their bearing on particular instances.

Every action of man towards another human being should stand the test of being in exact accordance with that action which the law applicable to all mankind under similar circumstances would dictate.

When there is this exact accordance we do that which is right; when there is any difference we do that which is wrong, and the extent of the wrong-doing may be directly measured by the extent of deviation between the act done and the act which ought to be done according to the moral law.

As, however, the moral law is the law of God, the extent of departure in the particular instance from that which is determined by the moral law is an exact measure of the wickedness of the act.

In our dealings with each other, perfect truthfulness in all matters is of primary importance. It was enjoined in a remarkable manner in both the Old and in the New Testaments. Without truth in ourselves it is impossible to obtain the confidence of other men, and without truth other men cannot impress us with confidence.

What, then, is truth? Truth is the idea of the accordance of all the images implanted in our minds with a new idea presented to our mind.

It by no means follows that what we believe to be truth should accord with all knowledge, for it can only be compared with knowledge known to us. No truth can ever be accepted by the mind with our amount of limited knowledge as absolute truth, but the truth on any one point should continually be tested by a comparison of all known knowledge derived by different persons and under different circumstances.

Under the general idea that the laws of God are immutable, a truth when once intelligently established is applicable to all men for all time, and cannot according to the laws of the universe be ever changed.

The effect of falsity upon the mind when it discords with all known knowledge is sometimes so great that persons uttering a lie have been known to drop dead on the spot, in the same way as others have immediately died who suddenly have heard of some terrible event, as the death of a dear relative, or those who have been overwhelmed with joy at hearing that a friend who was supposed to be dead was really alive. A great lie cannot be suddenly uttered without a conflict in the mind and a shock to the body, and it requires training and practice to act a lie with equanimity and calmness. Short of death,

the telling of a lie will sometimes so upset the bodily functions that an attack of jaundice, a fit of the gout, or an attack of paralysis, may be the immediate result.

The importance of truth does not exist in all forms of religion, as there is one which holds that truth is good, but faith is better, and that for the sake of faith an untruth may be told. There is no surer test of the falsity of such religion.

The moral law is universal and applicable to every single person. What is good for ourselves is good for all other persons. We are but one amongst the whole, so in every action to obey strictly the moral law we must have no more consideration for ourselves than we have for others.

To seek our particular benefit without respect to the benefit of others is to be selfish, which is contrary to the whole law of Christ wherein thorough disinterestedness is taught.

To do unto others as you would that they should do unto you is an immensely comprehensive law. It governs in point of fact every action of one person towards another, and every act in the particular instance which does not accord with the laws for all persons and for all times is vicious; but if it will stand this test it is virtuous, and may be taken as a partial exemplification of an example of action under the law.

Virtue is not so easily attained under this law as at first sight appears. The law is universal, and any action under it must stand the test of universality. Thus if we do good to any particular man we must be just to all other men; and as each of us is one of the other men we must be just to ourselves. Thus when we comply with the wish of any person we have to consider how the grati-

fication of that wish may affect every other person before we can determine that our act has been according to the law of God.

There is another difficulty. Every man has had differences of experience, and has abstracted for himself some differences in the law which his reason has impressed upon his mind. Every man therefore is to a certain limited extent a law to himself. He must not then rely on his own particular unaided reason, but must compare it with the laws formed by other minds over numbers of persons, and extending over great intervals of time.

Another great moral law is to love one's neighbour as oneself. This is a law of action to every other man, and agrees with it, if it is not even subordinate to the laws of disinterestedness. Do we not see this law obeyed to the minutest tittle when a person sacrifices his pleasures, or even his life, for the love which he shows for others?

Again, duty is a law to which all actions should be obedient. To act from a sense of duty is to act strictly under the moral laws which ought to govern in each particular case. Our duty to ourselves is to live strictly in accordance with the general laws by which all men, or even all organised beings, are regulated by nature; and our duty to others is a strict obedience to the moral law. When we perfectly do our duty we obey the moral law of God in the particular instances in which we have to act.

Probably the laws of Christ comprise practical examples of general laws to regulate every case of action, but Christian doctrine directly includes the more ancient laws of the Old Testament. The ten commandments are very distinct general laws, applicable to a vast variety of cases, and they are so plain and intelligible that they can be

clearly understood by the meanest capacities and applied to regulate action.

The moral law as a whole may be worked out and set out in words and language so as to show under what principles governments should act towards each other; how governments should act to the governed, and the governed to the governments; how employers should act to the employed, and the employed to the employers; parents towards children, and children towards parents; how the clergy should act to their congregation, and their congregations to the clergy; how neighbours should act towards each other; how the poor should act towards the rich, and the rich towards the poor; and, in fact, how every person should act to every other living person at every place, under every time, and under every possible combination of circumstances.

The law of the land to restrain offenders should agree in the most minute particular with the moral laws, so that every man may know what is wrong, and the punishment which he is likely to incur from doing wrong. This would be a great contribution towards right action. Few can tell under every circumstance what should be considered right or denounced as wrong, and if wrong not even a lawyer can tell offhand what law bears upon the case.

The vice of the day is to neglect the action of the moral law as a regulator of our actions. It is frequently called contemptuously Practical Christianity, and in lieu thereof the human mind is stimulated by all kinds of sensational faiths which cannot have any possible bearing on our action, but tend to general wrong as they dispense with immediate and personal responsibility, inasmuch as faith in a dogma may be used as a compensation for vice. Any one who substitutes idle beliefs for the moral law is greatly

damaged in action, and when false faiths are relied upon to compensate for a violation of the moral law, a man will act for his immediate advantage. It may be convenient for him to attempt to pass for a religious man. Let no such man be trusted.

We have already minutely considered how practical action should in every case be an example of general law, and we have indicated how these laws are not so easy to be applied suddenly in any case which requires our action. From this cause every man ought to think out for himself sub-laws, and men may be profitably employed for the general benefit in developing laws and showing their bearing on every possible act which may be submitted for our determination.

A medical man does that for the practice of his profession. When he has a case of disease presented to his notice, he has already by study and thought made himself acquainted with all which may happen from that disease, how these several events may be controlled by various treatments; and the well-trained physician, the moment he has learnt the facts of the case, knows how to apply the laws of nature for his patient's benefit. Of course cases arise where he has not sufficient experience to decide with this rapidity, but then he brings all his analogous knowledge to bear upon the special case under the general law which is the law of nature.

And lawyers, like medical men, make themselves acquainted with general laws and subordinate bearings, so that when a case comes before them they recommend a line of action as soon as they become acquainted with all the circumstances of the case.

Following the experiences of the doctor and lawyer, all mankind ought to be thoroughly acquainted with

general laws and their action upon thought to particular cases, that they may be ready at any moment to perceive how to do right and to act naturally upon the occasion. In this manner the clergy may be of infinite use to mankind by affording a strict demonstration of the physical and moral laws of God with their bearing, through every department of the mind to the particular case, so that man may know instantaneously how to do right and to avoid wrong, how to follow virtue and reject vice.

CHAPTER XIII.

ON THE INFLUENCE OF FAITH ON THE MIND.

Few ideas perfect—Faith supplies imperfections—Aisthenic faith—Syndramic faith—Exercise of faith supplies deficiencies of knowledge—Faith not certain but probable—Conditions of true faith—False faith—Noemic faith—Pneuma-noemic faith—Sure faith—Law of true faith—Examples of trust by faith—Examples of distrust—Faith demands reason—Reason should discard false faith.

During every operation of the mind some uncertainty is liable to exist, because it is rare that we have every part of an idea before the mind at one time, in its fullest detail and perfection.

We deal with this unknown part of every idea by faith, and therefore faith supplies the material for any gap which may exist in every idea which is employed in the wider operations of the mind.

Some persons would like to ignore faith altogether; but, unfortunately for them, if their mental thoughts are carefully scrutinized, we find that they are compelled to exercise a large share of faith at all times, and there is scarcely an idea presented to the mind that does not involve the exercise of more or less faith.

And first of all, in the images obtained by the use of the organs of sensation, we frequently do not have the correct

and entire representation of an object, from the change of structure in the eye or other cause, which gap is supplied by faith. This may be called aisthenic faith. In the use of the eye in a natural state, there is always a gap in the field of vision, produced by a spot at the back of the eye, where the optic nerve enters. We therefore never see, at one time, the entire prospect; but the part not represented we fill up unconsciously by faith, and consider that we really see the picture as though no such gap was present. Those engaged in minute researches, with either the microscope or telescope, avoid this error to the utmost possible extent. One of our most esteemed Presidents of the Astronomical Society, having detected a slight defect in his eye, immediately gave away his magnificent telescope which he himself had constructed, because he did not consider that it was consistent with the accuracy of scientific investigation to rely upon faith to rectify the deficiencies of his eye which he had detected.

In regarding some objects, we rely upon faith to supply the picture of the parts of the object unseen. Thus if we look at a ball, we do not see all the parts of the ball, but we see a considerable portion. That which is seen and pictured on the brain supplies an idea, to which is conjoined a picture supplied by faith of the part unseen; when the two together give us the idea of a round ball. This is syndramic faith, and is exercised every moment of our lives; for scarcely any one syndramic idea is represented to our minds in a thoroughly perfect manner, through our organs of sensation from objects existing in the external world.

In supplying the details by faith of the appearance of those parts of the ball which we do not actually see, we know how much faith might deceive our understanding; for the part of the ball unseen might, instead of being a circle,

have a protuberance, and then the body which we took to be a sphere by faith, would have a form widely different.

Let us pause to consider the nature of the ideas which faith completes, by adding to the parts which the mind directly obtains.

Every exercise of faith involves the rectification of some imperfection or deficiency in the natural idea existing in the mind. The exercise of faith does not communicate certainty to the idea, but only probability. The smaller the deficiencies supplied by faith, the higher is the probability of accuracy; the greater the deficiency, the less is the probability of truth.

True faith involves, as a necessity, that the parts of an idea which are known should exactly accord with all former known knowledge; and that the hiatus filled up by faith should also so accord with it, that the image so composed should agree with a similar perfect image as it would have been derived from the external world.

False faith naturally may be exemplified by the part of the idea deficient, but supplied by faith varying in any manner from all former knowledge existing in the mind.

Every exercise of faith has therefore to be tested by reason. Faith can only be safely used with reason, and faith without reason is the most dangerous addition to pure thought which the mind can possibly employ. Rational faith is in the highest degree useful to man; irrational faith is destructive to true reason and proper practical determination.

With these general considerations of faith before our minds, and with the perception how gaps in our knowledge can be profitably filled by faith based upon reason, we obtain a knowledge how faith affects the higher departments of thought.

Noemic faith supplies larger gaps in our knowledge. When the mind has only facts sufficient to partially induce general laws, faith steps in and enables us in a very useful manner to induce general laws, though in every such universal law much remains to us unknown.

Although faith is of paramount importance in every department, its extreme influence on human thought is nowhere more powerfully seen than in the formation and application of general laws, where frequently much which is unknown, and is not before the mind, has to be supplied by faith in their application to particular instances.

Rational noemic faith is of great value to mankind, though irrational noemic faith is an extreme danger, because it may lead to wrong action over a vast number of particular instances.

To take an example; numbers of persons within my own knowledge have tried to obtain motive power and the electric light upon their own formed general laws, based upon irrational faith. Some have much impoverished themselves in the attempt; whereas, had they used the true law now known to us, that no physical force is generated without a corresponding change of matter, they might have saved their money and spared their labour.

In the highest ideas of the mind, rational faith has as much more importance in governing our thoughts, as the extreme magnitude of the pneuma-noemic thoughts are above the lower ideas of the mind.

The greatest exercise of faith, in one sense, is shown in our idea of the true God and of the immortality of man, because no man has seen God at any time. No one has seen a man in his immortal condition. The magnitude of the unknown, and consequently the extent of our faith in these spiritual ideas, is immense.

On the other hand, there is, in admitting our faith in God and immortality, no discordance between all the knowledge of one man or even of all men, and those ideas drawn from reason and faith, and therefore we hold those ideas by reason on sure faith.

There are a vast number of pneuma-noemic or religious ideas, where the sureness of the faith presents differences of degree, and even these degrees of sureness differ with the knowledge existing in the minds of different persons.

For this reason mankind very properly allows differences of religious faith in different persons, provided, and provided only, that faith is governed by reason, that the part is in subjection to the whole; otherwise in the higher departments of religious thought, as in the lower ideas of the mind, if faith without reason be allowed, irrational faith occurs, which is strongly destructive to the integrity of the human mind.

True religious thought and true faith should always go hand and hand. Wherever faith is exercised, 'a reason for the faith which is in us' should be shown. Faith should be tested by every power and thought of the mind, and we should be able to 'prove all things,' that we may hold fast to that which is good.

There is only one law for true faith, which acts on every thought of the mind, and that is, true faith must stand the test of reason. The teachers of false religions insist on faith being superior to reason and independent of it, and on truth being subservient to faith. There is no greater test of the truth of any religious thought than its obedience to all knowledge; and any person who promotes the doctrine of any faith without reason, is unworthy of credit, and his religion should be discarded as false and unnatural.

Whilst our ideas and thoughts so much depend upon the

exercise, in a legitimate manner, of true rational faith, so our actions are also profitably governed by rational faith.

When we sow seed, what a wonderful exercise of rational faith is evinced! We have faith that the world will run its accustomed course, that rain and dew will refresh the earth; we have faith that the seed will germinate, that the sun will cause the plant to grow and ripen its fruit; and we have the most implicit faith that the laws of the universe, that is, the laws of God, will continue to exercise their operations, and that the seed will be got into the barn for the use of man.

The faith which we have in sowing now to reap hereafter, is based upon our reasoning on the immutable laws of God; and we can but notice that we should not by any means place such implicit faith if these laws were varied by the will, or even at the prayer, of man. And it is good for us, with our imperfect understanding in relation to the infinite cause, that we have no power to vary His immutable laws.

This exercise of faith must always powerfully affect us, when we sow one year to reap in the second; and when we plant the acorn to produce timber one thousand years afterwards, how powerful is our faith in the omnipotence of God and the immutability of His laws; for if they were subject to variation or caprice, our labour would be in vain.

Passing from greater actions depending upon faith, we have still intricate cases which are regulated upon faith. Do we not necessarily place faith in each other? Do we not frequently as implicitly place faith in the actions of others as we should in the actions of ourselves? How many actions of our lives depend upon faith in the action of other persons, and how rare are the cases in which our faith is violated as compared with the cases where our faith has not been bestowed in vain. When our house is closed at night,

and all the inmates become unconscious in sleep, how great faith do we place, and properly place, in our fellow-creatures, that they will do us no harm, when we are unable to protect ourselves, in the unconscious state of rest, but would do us any good should the opportunity be presented.

Faith, then, is abundantly shown in all our thoughts and actions, and probably begins at a very early period of our childhood, for how pure and beautiful is the faith shown by the child in the protection to be afforded by its nurse and by those around him.

Faith has to be exercised not only in time present, but over events in time past, and events which are to happen in time to come.

We have already seen that we are exercising faith every moment of our lives, but we have to exercise a large amount of faith upon events which have taken place in times past. History never thoroughly satisfies the mind, from the large amount of unknown events which it contains. The historian puts together all the facts which he can obtain in an unity of narrative. When he comes to describe motives of action, he has to supply much from his own faith, and has to draw much upon the faith of his readers.

And if we test past history, by a record of the events taking place at the present time, we observe how imperfectly we can obtain a knowledge of the motives of the actors in the scene around us, and how much we must draw upon faith, to mould the evident facts into one consistent whole.

With regard to the probability of any future event it has already been shown how much faith we must place in the immutability of the laws of God in all natural events, and in the correctness of the actions of our fellow-men when we place any trust in their future proceedings.

Whilst we place faith in that which our minds by our

reason commend, so we place distrust in that which from any imperfection does not commend itself to our reason to admit by faith.

Some men we distrust from a knowledge of their great want of principle. Others we distrust because their minds are undisciplined, and they give way to impulse, to temper, to envy, or other bad qualities, but in these cases we exercise faith because, in the unknown, reason decides that their conduct will not be satisfactory, and we have a full faith that they will act wrongly. It has been already observed that on filling up the gaps in knowledge and thought by faith, those who exercise their memories and thoroughly investigate all past knowledge by imagination, and subsequent judgment and comparison, have a much higher perception than those who do not exercise their higher mental powers.

Imagination is based upon antecedent knowledge. We can arrange the knowledge of the past in many ways and examine what is certain and what is based on faith. In this way we arrive at the truth of our various convictions, and we apply our bygone knowledge on many hypothetical events which intensifies the effect of general laws whether of God or man, and this has a most beneficial effect on our religious principles.

Faith has already been proved to be untrustworthy without reason, and an idea involving faith is only to be received by the mind upon three conditions. Firstly, that the part of the idea which is known stands the test of reason, from its being in exact accordance with all pre-existing knowledge, and all pre-existing human laws; and, secondly, that there is nothing in that part of the idea supplied by faith which is inconsistent with reason; and lastly, that the idea as a whole is conjointly obedient to

the general laws of man, to the moral law, and to the laws of the universe.

If we severely test our faith by reason how many false and idle faiths shall we avoid, and how spurious religion will give way to that pure and holy religion which it ought to be the desire of all of us to attain.

There is no question that many ideas, and especially religious ideas, which have been received by many of us by faith will not stand this severe test of reason. In all these cases the belief should be subjected to the thoughts and reasons of many minds that true religion may prevail.

In ideas affecting a large mass of mankind, it is highly desirable that the thoughts of a large number of persons should be affected, as no doubt that course is more beneficial than if one or two persons set up opinions for themselves, and isolate themselves from the general public. It is not a long time ago that witchcraft was believed by the community, but by universal consent this false faith was dropped, and at the present time nobody is found to believe in it; and many other false ideas which are now religiously but falsely held, we may hope will cease by themselves, and both clergy and laity should earnestly strive for pure religious faith.

All great rectifications of error to be effectual should be gradual. Every one fully believes that there are error and superstition at the present time still amongst us, probably handed down to us from pagan religions. We should all have full faith that we are endowed with reason powerful enough, if used with all our hearts and minds, to find out in the long run that which is right and to eschew that which is wrong; and it is better that truth should continuously and gradually unfold itself, that all matters of spurious faith should drop aside. In the meantime, we

should bear with each other, in the false beliefs, which are fixed in some men's minds.

The continual desire for truth for the sake of truth, will maintain our faith in that which is right and restrain our faith from that which is wrong. Every one should be shunned as an enemy of mankind who desires obedience to man on blind faith without reason, and he alone should be trusted who enjoins rational faith in subjection to the moral and physical laws of God.

CHAPTER XIV.

FALLACIES OF THE HUMAN MIND.

Aisthenic fallacies—Syndramic fallacies—Noemic fallacies—Different qualities of ideas should have different words—Pneuma-noemic fallacies — Mnemonic fallacies — Fallacies of judgment and comparison: of technical knowledge: of faith: of cause: of time: of pleasure and pain—Dynamic fallacies.

THE mind of man, so excellent in its design and so perfect in its action, might be thought at all times to evince its wonderful properties: we find, like all other intricate contrivances, it is liable to go wrong and to exhibit fallacies.

First, the mechanism of the organs of sensation requires to be accurately tested, for us to know that they receive and are competent to admit proper impressions from the external world. The eye, our most important organ of sense, is liable to considerable variations. Its optical contrivances may undergo some trifling change during the process of nutrition, and form a distorted or imperfect image on the retina, and the retina itself may not be sensitive to all the colours of the rainbow. Errors arising from changes in the mere physical apparatus of the eye are not uncommon, and sometimes may be very serious, as when a signalman cannot detect green from red, although upon that difference of colour being rightly seen the lives or integrity of the limbs of all the persons travelling in a long train depend.

There are fallacies arising from the nose, by a wrong appreciation of odour, and from the tongue by a wrong appreciation of savour. All the other organs of sensation may be unable in like manner to perform their functions perfectly, and thus give rise to error.

Aisthenic Fallacies.—The fallacies originating in the organs of sensation may be called aisthenic fallacies. To avoid them, our organs of sensation should be tested periodically, as we test our sextants, microscopes, or telescopes, to prevent our having any fallacious idea represented to the mind.

We must then ascertain that in the external world itself there is not any peculiar circumstance to guide our judgment; for instance, a landscape would lead to a very different idea if it were illuminated with a red, yellow, or blue light, instead of white light, as is ordinarily the case. Our natural philosophers are very careful to avoid these aisthenic fallacies, by critically examining every part of the idea submitted to the mind.

Syndramic Fallacies.—Syndramic fallacies are frequently complicated in their causes, and without great care are difficult of detection. As an example, I was looking out of the window at a house on a lake in Scotland, when to my surprise I saw the familiar rocks, which so delighted the eye on one side of the lake, apparently transferred to the other. There could be no mistake as to what was seen, and for the moment I was so puzzled that I really did not know what to do. The matter needed minute investigation; and on rising to discover the cause, I perceived that the result was owing to the rocks of one side of the lake being reflected from the surface of the plate-glass windows, which reflection being added to the view of the other side of the lake, resulted in a picture in which the woods and fields

were conjoined with the rocks and trees of the opposite shore to produce one conjoined picture.

I have taken the phenomena of pictures derived from vision to illustrate my meaning, but every other organ of sensation is liable to produce ideas in the mind more or less fallacious. The conjurer incites fallacy in the mind through the medium of the eye; the ventriloquist deceives through the medium of the ear.

Noemic Fallacies.—When there is any deficiency either in the organs of sensation or in the ideas derived therefrom, the conclusion derived from reason would be wrong, although the reason itself would be right, and that would be one source of fallacy.

Another source of fallacy depends upon the relative intensity of an immediately received idea, when contrasted with former ideas existing in the mind; for if either be too powerful, a fallacious reasoning will result.

In the exercise of the faculty of abstraction, a want of sufficient facts, or the reception of imperfect facts, is the most common source of error, so much so, that it is a common expression, 'Be sure of your facts before you make your deductions.'

In discoursing on words and language, I have pointed out the leading fallacies which may intentionally or accidentally arise, but there are yet other fallacies in connexion with reason which originate in the mind.

No fallacy is more common than to dissever an abstract idea, induced from the lower syndramic ideas, from the images from which it has been abstracted, and then to give it the character of a single syndramic idea; thus persons are apt to think that there is a something which they call heat, light, and electricity, apart from the mode of motion which is called heat, light, or electricity.

It occurs to me that this is owing to an imperfect method of use of words and language which requires rectification; for no word used to signify an abstraction, or to convey an abstract idea, should ever be employed to express a syndramic idea.

Although we may look forward in the progress of human knowledge to a more accurate nomenclature in the future, some benefit might be obtained at the present time by using words as now commonly employed by us, set up in a different type in our books, for each of three sets of words adapted to the three great classes of ideas. Words representing pictures or syndramic ideas of simple objects might be represented with a capital initial letter; words used for ideas abstracted from syndramic ideas might be printed in small capitals, and words expressing ideas connected with the infinite might always be printed in large capitals.

Syndramic words.

Dog, House, Man, Cat, Stone, Water, Land, Gas.

Noemic words.

Light, Heat, Electricity, Sound, Odour, Cause, Time, Life.

Pneuma-Noemic words.

GOD, IMMORTALITY, ETERNITY, THE SOUL, INFINITY.

Probably by the constant habit of printing the three great classes of words in three different manners, the mind having continually the three great gradations before it, would be saved from being unable to distinguish an

abstraction of a vast mass of phenomena, which have been represented in the mind, from a single mental picture.

Throughout this work, at every page, it has been found difficult to class the ideas existing in the mind under the three leading categories, so as to convey to another person untrained to thought the precise difference which these three great classes of words present to our understandings, and metaphysical science can only be advanced by a clear definition of the words used.

Pneuma-Noemic Fallacies.— The highest abstractions which the mind forms of ideas presented for its consideration, are those which are connected with totality, from which we derive the idea of infinity. Infinity of either time or space does not appertain to matter, but should ever be separated from it. Nevertheless, it is a common error to confound earthly with unearthly ideas; material qualities with infinite attributes.

This fallacy leads to all forms of unholy beliefs and pagan religions; for he alone who constantly and accurately separates the material from the immaterial, the Creator from the created, can have that pure and holy religion to which all of us should aspire.

Pneuma-noemic fallacies are the basis of much of the false religions which have degraded men for ages. They lead to the use of false gods, to the worship sometimes of good men, at others to the worship of animals, and even to prostration before the rude rock and sculptured stone, instead of the worship of God and God alone.

Mnemonic Fallacies.—Memory is a fruitful source of fallacy, for the idea representing an entire event does not reappear in all its integrity, or parts of two images appear simultaneously.

In giving evidence before a Committee of the House of

Commons, I once, upon being suddenly asked, replied that a monk at a particular time had a white cloak, but afterwards on reflection remembered that he had a black cloak at the time mentioned. The fallacy arose from having seen a number of monks more recently in Italy. As soon as the error was detected, I went again to the Committee and explained the circumstance.

Many persons frequently forget proper names of persons, although their images are firmly fixed in the mind: this is a fruitful source of fallacy.

Imagination is based upon ideas which are remembered. Two or more ideas are combined together, or parts of ideas are separated from the whole and conjoined. Imagination should always be kept subordinate to reason, or it may lead to innumerable and dangerous fallacies.

Perhaps the act of judgment is less liable to fallacy than the ideas on which this act is based. Judgment has only to do with the materials before the mind; and when all the ideas and parts of ideas are correct upon which comparison and judgment are based, judgment is generally properly exercised. To preserve true judgment, we should be ever careful that the single ideas existing in the mind should be true.

There are some recondite questions of fallacy arising from a misapplication of technical knowledge, as in the application of the doctrine of averages and of means and limits. A general wanting to clothe his army, ascertained that the average height of all his men was five feet six inches. He ordered fifty thousand suits of clothes, and when they came home, not one single suit fitted any one man; for the army was composed of men from two races, in one of which the men exceeded six feet in height, and in the other the men were below five feet in height, so that the

clothes were too small for the tall men and too large for the short men.

Fallacies of Faith.—Faith is a constant source of fallacy, for if there is not a due reliance in faith we should be constantly led to inaction; but, on the other hand, if we have too much faith, or rather an undue faith in supplying any unknown parts of an idea, we may be led to fallacies to prevent which we should ever so subjugate our faith, that no excessive idea should be developed.

Fallacies of faith are constantly seen in a partial manner. It is a fallacy of faith to place an undue trust in medicinal agents, but it is worse fallacy of faith to suppose an ignorant quack or a globulist can cure when knowledge fails. There is no period in the world's history where fallacies of faith are not of daily occurrence. Now it is in homœopathic globules, formerly it was in touch pieces; and it is generally observed that a man who is a victim of one fallacy of faith is usually a victim of many, because his mind is not well balanced.

Fallacies of Cause.—There are frequent fallacies arising from a misapplied cause, because cause involves a sequence of events, and it is not always possible to know for certainty what part of an event acts, as the cause to produce the effect. Sometimes the mind has only before it the effect and not the cause, such as when a theft is committed, the objects stolen have been removed from their former position, but what was the cause has never come before the mind.

The fallacies of cause commonly arise from concomitance being mistaken for cause; for instance, a boy is seen to throw a stone, and it is inferred because a stone broke a window and came into the room, that he threw the stone, whereas another boy unseen really threw the stone which did the damage.

Fallacies in point of time are most numerous, not only as to the rapidity or energy with which any events may occur, but also as to the order in succession in which the events occur.

Fallacies of Pleasure and Pain.—Undue and exalted ideas of pleasure or pain lead to many and serious fallacies. In these exalted states of mind, persons fall into religious ecstasies, and scream, jump, and dance sometimes in a nude state, regardless of all decency. These states partake of an hysterical condition, and begin in one person, when the similar state is taken up by others, and further stimulated and excited by those who ought to know better, till it reaches a mental epidemic, and spreads from country to country.

In history numerous instances have occurred, from the mania of Tarantula dances to the last outbreak in the New Forest now under exhibition. It behoves us all so to quiet and calm our mental operations, that such insensate exhibitions of excited imagination should be repressed.

Apart from these violent expressions of passion, we are liable to exhibit undue fear at a suppositious accession of pain, or to attach too much importance to pleasure.

The latter leads to the love of money and an undue desire of gain, which, although pleasurable at the moment, too often leads to future pain, so that the ideas of pleasure and pain should ever be kept in proper balance; that neither present pleasure, present pain, future pleasure, or future pain, infinitely enduring pleasure or infinitely enduring pain, should have otherwise than properly influence on our actions.

Dynamic Fallacies.—When all the powers of the mind are perfect, and none are stimulated at the expense of the others, action may be expected to be properly regulated, and con-

trolled; nevertheless, sometimes we do not adjust our muscular movements with sufficient accuracy to perform the act which is intended. Numerous accidents arise from too hasty movements, we miss our footing, we strike our hands, we do not hit the mark, solely because the whole mind is not brought to bear accurately to adjust our muscular movements.

We thus perceive that the leading properties of the mind, the aisthenic, syndramic, noemic, pneuma-noemic, and dynamic, all contribute to fallacy. We find also that our feelings of pleasure and pain also contribute to fallacy. We find that fallacy arises from mode of action, and so we should ever remember that the mind is one whole, and that a proper balance should be preserved to maintain its highest integrity; and that contrariwise, if that proper balance is not efficiently maintained, that fallacious ideas will arise which may at any time lead to fallacies of action.

CHAPTER XV.

THEORY OF MENTAL ACTION.

Mechanism of organs of sensation voltaic—Nervous system a system of compound voltaic batteries—Influence of voltaic electricity on the circulation of the blood—Structure of the nervous fibres—Theory of instinct—Nervous system one organ—Principles of the human mind in health and disease—Defective states of mind—Abstract ideas—Mechanism of abstraction—Mode of abstraction—Difficulty of communicating abstract ideas—Future conflict of ideas—Importance of the study of abstract ideas.

Up to this point, the facts which have come under our notice have not presented any very considerable difficulty; but I must now beg my reader to give his undivided attention to those which I am about to adduce, inasmuch as from them my natural theory of mental philosophy has been derived.

Experiment 1.—I introduced two steel needles into a rabbit: the first into the masseter, or muscle which enables the creature to masticate, the other into the subcutaneous cellular tissues. After two or three minutes the creature, which was very tame, attempted to bite my finger; the powers of volition acted on the muscles. This influenced

the two steel needles, and produced deflection of the galvanometer to which they were attached.

Sub-experiment. — I have repeated this experiment on rabbits, cats, eels, and various other animals, with the same results.

Commentary.—This experiment clearly showed that the current was produced between the terminations of the sensor nerves distributed to the skin, and the motor nerves distributed to the muscles. Hence it is inferred that the current forms a circle through the sensor and motor nerves to the brain. It also shows that this current was produced by what is termed volition.

Experiment 2.—I introduced two needles under the skin of a rabbit and afterwards gently irritated the skin, when the galvanometer was deflected as in the last experiment.

Sub-experiment.—The results of this experiment are also very clearly shown in the eel and other creatures.

Commentary.—From these facts we learn that the action of the skin which gives rise to sensation is accompanied by the voltaic force.

Experiment 3.—I introduced one needle into the eye and a second into the muscles of the eyeball, when I obtained a slight deflection on throwing a very concentrated light into that organ.

Sub-experiment.—I varied the position of the needle, but, upon the whole, I obtained the greatest deflection when one needle was thrust through the choroid, the second through the muscle of the eyeball.

Commentary.—This experiment indicates that the action of light upon the eye determines a voltaic current between the muscle and the choroid.

Experiment 4.—I introduced a needle into a rabbit's

nose, and another into the subcutaneous tissues. On stimulating the nose with a strong odour, deflection occurred.

Sub-experiment.—I have repeated these experiments in cats and rabbits, but the animals have a great repugnance to it.

Commentary.—This experiment shows that the mechanism of smelling is voltaic.

Observation 1.—The mechanism of the bodies of men and animals is so arranged, that the motor nerves are distributed to the muscles, the sensor nerves to the skin and other organs of sensation, both of which are abundantly vascular. The two sets of nerves are continued up to the brain where they terminate in vesicles, in contact with the highly vascular tissues which will be hereafter described.

Commentary.—According to voltaic laws, it follows, from these observations, that a second battery must there exist opposed to the one in the body. Hence we are compelled to admit that the general structure of man and animals is that of a double series of voltaic batteries.

Experiment 5.—If all the sensor and motor nerves, in their course to the brain, be divided, the power of sensation and motion is instantly annihilated, and life is extinguished. This result occurs when an animal is beheaded or the top of the spinal chord is divided, as by the process of pithing.

Commentary.—This result is dependent upon the body, which consists of one series of voltaic batteries being separated from the brain, which is made up of the second series opposed to them.

Experiment 6.—If a frog's foot be arranged under the microscope, and an intense electrical current passed through it, the circulation instantly stops, and the lymph corpuscule

which comes, as it were, slowly along the sides of the vessel, is also in the same manner, stopped in its career.

Sub-experiment.—The same result happens not only with frogs but with fish of various kinds, when subjected to the action of the magneto-electric machine or powerful voltaic batteries.

Commentary.—By these experiments we learn the influence of the voltaic force upon blood corpuscules; and the phenomenon of blushing, or other increased vascularity from nervous excitement, is explained.

Observation 2.—The nervous fibres consist of tubes which are lined in their interior with fat, a substance which is well known to be one of the most perfect of all insulating bodies. Within the fat is contained a fluid; so that the whole resembles a gutta-percha tube filled with fluid. From the above experiments and observations, we learn that the entire nervous system, to which the whole of the rest of the organization is but an appendage, consists of a series of nerves, or tubes, which are prolonged, in one direction, into the brain; in the other, into the body, where one portion is distributed to the organs of sensation, the second to the muscular substance.

Observation 3.—As we find no provision in the body for insulating the termination of a motor or sensor nerve, it is manifest that every motor nerve is opposed to every sensor nerve, and every sensor nerve is opposed to every motor nerve.

Commentary.—In consequence of this arrangement, when any sensor nerve is stimulated, any motor nerve in the body may be excited to action.

Experiment 7.—If a voltaic current of a single pair be completed, through two solutions, one containing sulphate of copper, the other sulphate of zinc, and copper electrodes, are

used, in both instances the current will pass exclusively through the sulphate of copper.

Sub-experiment. — This experiment may be infinitely varied, but the current will always be found to pass by the readiest course, to the exclusion of all other roads.

Experiment 8.—When the needles are placed respectively in the muscle and cutaneous textures, the needle thrust through the muscular substance acts upon the galvanometer as though it were the zinc of a voltaic circuit.

Commentary.—Inasmuch as the current through these needles is the reverse of the current of the body, according to the well-known laws of electro-voltaic currents, it follows that the muscle is negative, the skin positive.

As far as the organs of thought or brain are concerned, we can only adduce the structure according to physical laws; but I have noticed an explanation in which volition or will is but the resultant of an immediate impression, and of all other impressions existing in the body.*

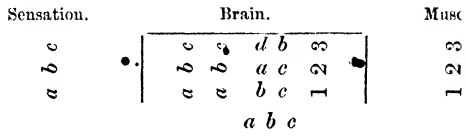
In the first place, we may assume that nerve for nerve is simply repeated in the brain; but, although this assumption tends to elucidate the structure on which account I have adopted it, yet a careful study of the properties of this repetition, taken in conjunction with the whole theoretical structure, rather seems to indicate that it might possibly be dispensed with.

It is, in the next place, absolutely necessary to assume that these primitive nervous fibres enter into certain combinations.

* In submitting animals to experiment I have on several occasions noticed deflection of the needle when thrust in the base of the brain. The animal, however, is instantly killed, and I have therefore not absolute certainty in the experiment which would allow me to introduce it into the text, though I must say I have no doubt in the fact.

Observation 4.—In every animal which has a brain, a multitude of fibres is found; and, according to the number of ideas which an animal can receive, so is the intricacy of their fibrous arrangements. In a former part of this work I have shown that the number of all the possible combinations which could be found of all the nervous fibres is so great that the skull could not possibly contain them all. Hence we may assume that these combinations only take place to a certain extent, which is also proved by facts which I cannot now consider.

This battery I call the combination * battery, and it is in the highest degree important. In animals there appears to me to be no evidence of a higher structure, and their nervous system may thus be represented.



The above mechanism, even without the repetition of the simple nerves in the brain, would be amply sufficient to account for all phenomena exhibited by animals. These creatures, we have found, only receive simple ideas, and, according to whether these simple ideas be pleasurable or painful, so is the cause of the action determined. For instance, volition, or actions through the nerves marked 1, 2, 3, would depend upon the character of the impression in the respective parts of the combination battery *a b*, *a c*, *b c*, *a b c*.

For the instinctive operations which animals manifest, we have only further to assume that action is determined in *a b*, *a c*, &c., by an influence produced in the process of

growth of the animal; and in that case it is certain that the idea of a nest may be implanted in the bird, of a comb in the wasp or bee, of a web in the spider, and upon this supposition we have a complete explanation of instinctive operations.

With respect, however, to man, we observe that he must have a structure by which he expresses a variety of ideas by one idea, or, in other words, induces a general law. The simplest mechanism by which this can be effected is, first, by combining every one combination of each sense into one, and thus one idea would appear for any action on that sense; secondly, I again assume that these enter into combination like single impressions; and, finally, that these are again connected together into one battery, from which the motor nerves spring.

From these views, man is made up of a great number of voltaic elements, so arranged as to form one whole. Hence, as the whole modifies the action of every single part, it follows that every idea existing in his brain modifies his action in any particular case.

From the diagrams which I have formed, it will be seen how an impression is supposed to be received from the external world, carried to the brain, and there registered. It will also be seen how it is supposed that we induce the properties of matter, and refer its creation to an infinite cause. In fact, according to my theory, we can never look at any object, feel any object, or be otherwise affected, without the infinite cause which gave rise to it occurring to our mind. In this sense God is always more or less before us.

According to the electro-voltaic doctrine, we induce certain principles of the human mind, and they appear to me, at any rate, to have the merit of avoiding many diffi-

culties which occur under other systems, more especially under those which infer an immaterial undefinable something which, by some persons, is supposed to join our material frames at some unknown spot, and move the body through them as a child would pull the strings of a puppet. I will not descant upon this view which is now not held by any natural philosopher of note. In fact, its existence would only show that Providence had formed man to act by a clumsy method, for it is apparent, that if an immaterial something caused the motion of the arm to raise a weight, then it would have been a far simpler contrivance for that immaterial to have acted on the weight without the intervention of the arm.

Principles of the Human Mind.

i. Our ideas of the external world arise primarily, from our actions upon the ultimate nervous fibres of the organs of sensation, by the specific stimulus competent to excite each organ of sensation respectively.

ii. Each primitive nervous fibril is called a unit; a repetition of units *numbers*.

iii. That which is competent to act on these nervous fibrils is called *matter*.

iv. Whenever matter undergoes any change which renders it appreciable to our senses it is said to evince *force*.

v. The definite combination of nervous fibres excited to action determines the *character of the idea* presented to the mind, such as form, position, magnitude.

vi. Each combination may be expressed by a word or cypher, and forms a definite image.

vii. The sum total of all possible combinations of the ultimate nervous fibrils, excited to action, comprises all the possible images which can be represented to the mind.

viii. Inasmuch as the possible combination of all the nervous fibrils is immensely numerous, so are the images which may be reflected in the mind immensely numerous.

ix. An idea is represented to the mind when any one or more of the filaments of either specific organ of sensation is excited without reference to the definite image thereby produced.

x. This solitary idea derived from the filaments of the eye is termed *vision;* of the ear, *hearing;* of the nose, *smelling;* of the palate, *tasting;* of the skin, *feeling;* and, probably, from the nerves communicating the changes occurring in our own body, *personality.*

xi. The perfect knowledge of any object is obtained by impressions received by the sum of the organs of sensation.

xii. But as matter may exist without exciting all the organs of sensation at one time, we determine the combination of senses which has concurred to give us the knowledge of any external object.

xiii. An idea is represented from the excitement of one or all the nervous fibrils of any organ of sensation indiscriminately. This idea is infinite, inasmuch as it is indivisible, incapable of addition, and represents totality.*

xiv. Our knowledge of the external world at any given period is the sum total of the images from all our senses.

xv. These images represented to the mind are perpetually changing.

xvi. When images change one remains; the other changes perhaps several times before the first changes. The relation of these changes to each other is termed *the time of their occurrence;* that which changes the least frequently is said to be of the *longest duration.*

* Infinity is sometimes confounded with its hyperbolical sense of endless numbers.

xvii. In the change of images, when one specific image never appears without a similar antecedent, and the matter in the external world which gave rise to the first image set in motion the second, the antecedent image is said *to cause* the second image.

xviii. The mind finds great difficulty in distinguishing between concomitance and cause, because the matter which produces an antecedent image may not set in motion the matter which produced the second image.

xix. When images of the external world are produced with a certain intensity the idea of *pleasure* is excited, when with a greater intensity the idea of *pain*.*

xx. The transition from pleasure to pain being sudden, not gradual, it follows that the nature of the action on the brain, and consequently of the ideas, is different.

xxi. An image once formed in the brain produces an indelible impression, and may at any future time recur. This property is called *memory*.

xxii. When an image is produced by an action upon the external senses, the actions on the organs of sense concur with the actions in the brain; and the image is then a *reality*.

xxiii. When an image occurs to the mind without a corresponding simultaneous action of the body it is called *thought*.

xxiv. The power to distinguish between a thought and a reality is called *consciousness*.

xxv. Several ideas must necessarily co-exist, giving rise to compound ideas always existing in the brain; thus, personality and infinity give us the idea of the soul; pleasure and infinity, of good; pain and infinity, of evil; cause and

* Every action of our lives is either pleasurable or painful, and thus we perceive how vastly the former state preponderates over the latter.

infinity, of God; time and infinity, of eternity; infinity, pleasure, and time, of heaven; infinity, pain, and time, of hell.*

xxvi. These intuitive ideas are not produced by the immediate action of external influences, but have their origin in the construction of the brain, or organ of thought. These intuitive ideas belong to the higher class of mental images; and there is no reason to suppose that more simple ideas are implanted as instinctive ideas in the human species.

xxvii. In the lower animals, however, it is apparent that either other images exist, which guide the creature to perform their operations—as the bird to build its nest, the bee the honeycomb—or that the nervous system is so constructed that the creature is led to perform specific acts under some definite excitement.

xxviii. When images already implanted in the brain which possess many points in common continually reappear, the party is said to be reflecting.

xxix. During reflection the influences of the external world to produce new images are entirely or to a great part neglected.

xxx. By reflection ideas may be combined so as to form general laws.

xxxi. By reflection general laws may be applied to specific instances, or images may be analyzed into their component parts.

xxxii. When an idea is represented to the mind it either accords or discords with other ideas previously received, or with general laws resulting therefrom, or with the

* As these intuitive ideas are simply thoughts, and cannot be proved by our external senses, the mind may be led at times to deny the reality of their existence. Reason and faith, however, declare their truth, and thus compensate for the natural weakness of man.

moral law. The determination between this concordance or discordance is called *judgment.*

xxxiii. Man has the power of uniting two or more antecedent images, or the parts of two or more antecedent images. By this power a totally new image is formed, and hence it is called *imagination.*

xxxiv. Observation is the basis of fancy; and the novelist is fruitful only in proportion as he stores his mind with natural images.

xxxv. Man acts by electricity, which is set in motion through the muscular structures, whereby contraction ensues, and parts of the body are moved.

xxxvi. Action may be produced by the immediate influence of the external agents upon the body, which give rise to a new image in the brain; and action may also be produced by the recurrence of a former image.

xxxvii. The mind is one and indivisible; and thus the particular muscular movement which the electrical force determines is not only regulated by an immediate image, but by every other image which has at any former time been implanted in the brain.

xxxviii. Pleasure and pain regulate all actions; hence the particular movement which is determined arises from the pleasurable or painful character of all former images; as animals, as well as human beings, seek those actions which are likely to be pleasurable, and eschew those which are likely to be painful.

xxxix. But the action determined in any particular instance may be painful, for the sake of obtaining greater pleasure at future periods; and the idea of obtaining infinite pleasure may allow of the most intense immediate pain.

xl. The idea of future pleasure is called hope; of future pain, fear. The government of mankind is conducted by exciting hope and fear.

xli. When a tendency to act exists, it is called *desire;* and always exists, more or less, when a being is in good health, and in a state free from fatigue.

xlii. All actions in the higher generalisations would give the idea either of infinite pleasure or of infinite pain. Actions which concur with those which lead to infinite pleasure are called virtuous, and those which lead to infinite pain are called vicious.

xliii. The moral law, being infinite, is competent to control all actions. It is therefore important that it should be frequently and strongly impressed upon the human mind.

xliv. The resultant of the force of an immediate stimulus and of all former ideas implanted in the brain, is termed *volition.*

xlv. A man is born a free agent; but after images are once implanted, he is compelled to act from the ideas existing in his brain. Hence, could we but tell the exact ideas which any human being possesses, and the relative value he assigns to each, it would be practicable to foretell his line of action under any defined circumstance.

xlvi. The term *life* is assigned to the idea which the mind forms of the capacity of an organised being to perform its functions.

xlvii. The term *death* is assigned to the idea which the mind receives of an organised being incompetent to perform any vital action.

xlviii. The term *mind* is assigned to the general idea of any action of the brain. An idea is the term assigned to any specific action of the brain.

xlix. Organisation is the term assigned to the construction of a being to adapt it to perform certain functions.

l. The mind has constantly represented to it the idea of a personality which will exist infinitely.

li. Whilst, however, the idea exists, we have no power to learn the properties of infinity; and hence we cannot define the nature of the state in which we shall live hereafter.

lii. Whenever an idea appears in the brain, which is neither intuitive, nor is due to external causes, nor is deduced by the ordinary operations of the brain, it is said to be an *insane idea.*

liii. When this idea is continuously the same, the party is said to have a *monomania.*

liv. When various images appear and vanish indiscriminately, the state is called *incoherence;* and when this state is combined with more or less unconsciousness, it is termed *delirium.*

lv. The danger of insane ideas depends upon the *distinctness* with which these ideas are impressed upon the brain; for they will determine the party to act in proportion to the power with which it is impressed.

lvi. To the violent actions arising from strongly implanted diseased ideas, the term mania is given; and the violence of the mania is proportionate to the power of the delusion. To the individual it is an exaltation of pleasure.

lvii. When, from the delusion, the patient is in continual fear, he is said to be *melancholy;* and it is probably, to the individual, an exaltation of pain.

lviii. When a fixed insane idea exists in the mind, the party cannot be said to be partially deluded; for, inasmuch

as the mind is one, and indivisible, it will control all his actions.*

lix. A strong moral impression may counteract an insane image, as a person may be kept from doing wrong, by feeling assured that it will lead to present or future inconvenience to himself.

lx. When the structure of the brain is congenitally defective, so that it cannot perform all its normal actions, the person is said to be an idiot.

lxi. Sometimes the power of memory is intermittent, or is totally lost, as after the frequent recurrence of epileptic fits.

lxii. Any interval of unconsciousness, except sleep, is called a fit.

lxiii. When, from loss of memory, or want of power in the brain, the functions of reflection or judgment are not perfectly performed, the individual is said to be *fatuous*.

lxiv. Sometimes the power of receiving impressions from the external world is diminished or lost, as in blindness, deafness, &c.

lxv. When parts of the body do not move by volition, they are said to be paralyzed.

lxvi. In old age, the brain loses its power to receive new images, to restore bygone impressions, to connect different images, or to apply general laws to specific instances. That which ennobles the man has passed away; the outward form remains, but the inward structure has lost its power to act. Childhood again ensues—not to acquire new ideas, but to forget those before implanted. All that is beautiful or desirable in this world has passed away; the brain has lost

* As a matter of jurisprudence it has been held by the Lord Chancellors, in the House of Lords, that the mind cannot be said to be partially deluded, inasmuch as it is one and indivisible.

its power—the mind ceases—the very existence of the man is unknown to himself, till death gives rise to a new life, and discloses that new and glorious state in which our organisation teaches us that man will be immaterial and immortal.

lxvii. As individuals differ in their organisation, it follows that they differ in their capacity to perform various acts; and we may presume that the mind, being one of the functions of the body, is of varying power in different individuals.

lxviii. The observations which apply to different individuals apply with greater force to different races.

To estimate the perfection of the mind, the organs of sensation should be carefully examined, to find whether the eye sees perfectly and correctly, the ear hears, the nose smells, the tongue tastes, and the skin feels, and besides, if a proper knowledge is obtained of the changes which take place within our own bodies.

It is then necessary to ascertain whether proper pictures of objects in the external world produce a due impression on the brain, that they may be retained for future use, and be duly remembered.

Comparison, thought, and judgment, must then be the object of attention; for if one is defective, the action of the mind will be imperfect; and in some states of disease we perceive that a man, otherwise learned and intelligent, cannot act upon all the facts of the case coupled with all other sources of information.

The mind does not exhibit its high qualities when the faculty of inducing general laws, and deducing from them their effect in particular instances, is not perfect, and the

mind exhibits great inferiority if it is not obedient to the moral law.

As the brain is the regulator of the direction of action, it should be one and entire. There should be a proper balance between all its powers, so that healthy mental action may be evinced.

In the discipline of the mind, absence of mind should be sedulously avoided, and full attention should be given to surrounding impressions. Illusions of the senses should be avoided by close observation, and hallucinations prevented by strict discipline of the judgment.

During contemplation and deliberation, long-continued absorption in the inner mental operations should be avoided, or we get a habit of what is called brown study; and so, also, should we restrain the influence of those religious enthusiasts who would generate within us the pernicious action of religious ecstasy, wherein the mind becomes absorbed in its own imaginations and fancies, and neglects the proper effect of surrounding circumstances. It is ever painful to observe the feebleness of mind which such a course produces.

Analogous mischief, but not to so great an extent, is caused by the habit of reverie, when a man neglects the information derived from his own mind, but continually excessively dwells upon beautiful ideas developed by men superior to himself, as Shakespeare, Milton, and other writers and poets, which are so superior that his own mind can hardly approach the noble sentiments which they have originated.

In action, we should examine if the will is determined by a well-balanced mind, that our muscular movements should be regulated by a healthy brain, duly and properly exercised

in all its departments. If action is so restrained, violent passion will be avoided. A definitive purpose will be exhibited in all our doings, vigour and determination will lead to success and brilliant action.

In our muscular systems, when cramp, convulsions, sleep-walking, dreams, hysteria or catalepsy occur, they mark a derangement of the bodily functions; for to exhibit the full perfection of the mind in its natural and characteristic beauty, it is necessary to possess a '*mens sana in corpore sano.*'

Every man possesses individuality. He differs from every other man in some slight respect. These differences may be arranged in groups. Thus every family differs slightly from every other family, every race differs from every other race, and the people of every nation show their peculiar nationality.

There is even a difference of mental capability in the two sexes; and although the difference is ever before our minds, how difficult it is to distinguish the difference of the power of mind between any one man and any one woman, yet between all men and all women the mind possesses a perfect distinctness which we can recognise.

Man exhibits the higher powers of thought and of construction, and is more daring in action. Ever ready to take command, he subdues by force. Woman deals with smaller matters, is loving, timid, and gentle in action; ever ready to obey, she leans upon the man for guidance and protection. In a perfect state, a man and woman are two persons with one mind, their thoughts are interwoven together, they act upon one design, and both live for one common object and their common benefit. The perfection of creation, and the omnipotence of design, is in no instance

more strikingly shown than in the mutual dependence of men and women.

Who then shall intervene between husband and wife to impair that unity of mind which nature has decreed? Surely it is the most accursed of all human wickedness to seek possession of the thoughts of women to govern men, or to rule communities. Yet there are not found wanting, amongst some pretended religious communities, those who dare to attempt, by the confessional, to separate the minds of those who have been joined together by the inscrutable wisdom of the Almighty.

When we examine the peculiarities of the mind of any one individual, we may employ the natural system of mental philosophy as detailed in this work; we may divide mankind, primarily, into five groups, the aisthenic, syndramic, noemic, pneuma-noemic, and dynamic, according as their respective faculties are developed; and, moreover, we may group together any combination of these mental qualities, such as aisthenic noemic, syndramic dynamic, etc.

But each respective faculty of the mind admits of subdivision, such as the aisthenic into six, five of which represent the mental power derived from the respective organs of sensation, and one from knowledge derived from bodily feeling. We may further subdivide these divisions into the various functions which are assigned to each organ of sense; thus a man may have a powerful vision for small objects, a great range of adjustment, a power for the appreciation of colours, a quickness in the perception of objects. Similar differences occur with every other organ of sensation, so that by this process we note a large number of mental peculiarities.

But the syndramic qualities of the mind not only com-

prise all those which appertain to the aisthenic, but superadd to them the faculty of receiving information from the words and the writing of others; and this second faculty again presents many varieties, from the classes of knowledge which the mind of any particular man is competent to receive, thus some men principally read of that which might be seen by the eye, others of that which may be heard by the ear.

Again, the same impression affects one man with pleasure, another with pain. The same amount of light which is a delight to one man is a pain to another, so that the number of all the above varieties of mind are doubled by these considerations.

Proceeding with the examination of the mind, we have to consider the noemic properties or powers of thought. These are still governed by all the lower subdivisions, but have characteristics superadded. The faculty of inducing laws and acting upon them, is highly important, as opposed to the property of vacillation, where the object to be obtained remains in doubt.

We must next observe the pneuma-noemic qualities of the mind by which it is regulated by the consideration of the Deity, of the soul, of eternity, of heaven, and of hell.

Further, the human mind is modified throughout all these subdivisions by memory or forgetfulness; for a man is in a totally different position if he sees and does not recall to his mind what has been seen, or if he thinks and does not remember the thought, from the man who clearly remembers the image seen or the law thought out.

There are, lastly, many varieties in the dynamic powers of the mind. Some persons are quick of action, others indolent. Some act from aisthenic impressions, others direct their actions by thought. Some are governed by religious

impressions, others act solely from the immediate impressions of pleasure or pain.

All these states of the mind are governed, not only as has been noticed before, by sex, but even by the age of the individual. The boy exhibits properties in the various departments of the mind different from those of the child, the youth from the boy, the adult from the youth, advanced life from the adult, and senility from advanced life.

The perfect man perceives vividly by his organs of sensation, registers the images, recalls them for future use, obtains the knowledge received by other persons which they record by word of mouth or by their books, deduces laws and remembers them, thoroughly comprehends the moral law, and acts with energy, calmness, and decision, in every case presented to him. When a man so acts, does he not exhibit the glorious perfection of the noblest work in nature?

The danger, however, of using the mind so that one department of it comes into play to the exclusion of the rest, is great, and is shown in those states of semi-consciousness which can be brought on by practice, in which a person does not keep his mind in balance by the action of impressions on the organs of sensation being carried to the brain, but lets his imagination riot in thoughts which he cannot distinguish from realities. He then sees what he is pleased to call visions, and appears to have fanciful communications with other persons, living or dead. This, however, which is occasionally an epidemic, must be regarded as a state of disease rather than as an instance of a healthy mind. These states of mind should be carefully guarded against, as exposing the sufferer to be a prey of those who hold spurious religions.

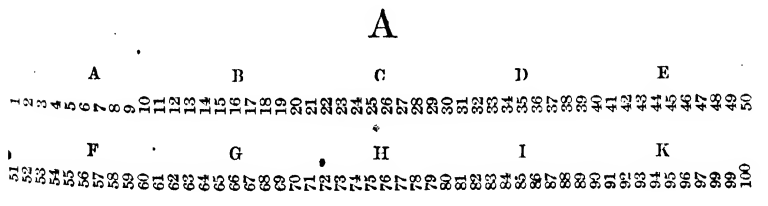
It has been already observed, that it is the peculiar

province of man to abstract, by virtue of which he uses words and language, and induces general laws. We have now to consider by what mechanism and in what manner this high quality is to be attained.

Perhaps but little difficulty attends the notion of a reception of an impression from the external world, its registration in the brain, and the consequent action of the muscles of the body. But it becomes somewhat more difficult for the mind to follow how the muscular action is determined, not only by the immediate impression, but also by impressions which have occurred, and which have been registered in the brain at some former time; but it becomes extremely difficult to comprehend how action is controlled by abstractions, that is to say, by general laws obtained from all former impressions.

The outlines of the material mechanism by which the nervous system acts, will be detailed in the last chapter of this work, and at the present moment our attention will be restricted to the probable mode of action of the brain in this particular.

For this purpose it will be convenient to refer to the relational machine, which was invented in mimicry of the action of the brain, and it is so designed that a number of lower impressions, designated by small letters, may be represented by a single capital letter. The machine is constructed in the plan of a geometric series of the function of 2, but for our present purpose let us assume one of the function of 10.



By this arrangement, we perceive that a is affirmatively affected if the first 10 filaments are acted upon, b for the second, &c., and that the large letter A is affirmatively affected when the whole 100 lower symbols are in action, and only partially when less than the whole are affected.

To attempt to illustrate this action in a practical manner, we may assume that every morning we come down to breakfast and find a fire burning in the grate, that nervous filaments in the body numbering from 20 to 30 are acted upon by the fire, this would invariably affect b, and therefore b would ever represent afterward heat, as an abstraction of the 10 nervous filaments excited to action; and whenever afterwards we talk of b, we should always have before us the effect of heat on our bodies.

The word abstract is offensive to ordinary minds, but it really signifies a composition of many ideas, so that many simple ideas may be repeated by a single higher idea, and the letter b, in the example given above, would always signify the actions of our primitive nervous fibrils numbered 20 to 30.

To illustrate this abstract matter still further, let 30 to 40 represent the nervous fibrils excited by combustible matter, which would be abstracted by c, and let d represent the abstraction of other matter with which c always combines to make heat, then the combination b c d would always be affected when the fire burns.

Following the illustration, supposing all the primitive nervous fibres governed by the letters a b c d e f g h i k are acted upon when all physical forces are present, and that no physical force is manifested, when none of the primitive nervous fibres from 1 to 100 are acted upon, then great A would be the abstraction of the mental action of all physical forces; and supposing, moreover, that when any one physical

force is manifested, two kinds of matter are always present, which change either in position or character, then the mind forms the great comprehensive law that all physical forces depend upon a change of matter.

Even in the latter illustration there is a change of images in the brain, for we must start with particles of matter in one state which during the manifestation of force become matter in another position or state.

This is confessedly very difficult to follow, and for the mind thoroughly to appreciate the state it must be concentrated within itself; the difficulty arises from the number of parts of which the nervous circle is made up. It is, however, one whole, and whenever a group of subjects is intelligently brought before the mind, we are enabled, by being master of this natural process of reason, to see all the bearings in an instant of time, though it may take hours to set out the whole train of thought by words.

The relational machine and relational slate have been designed from a study of the mind, so that we may put down in writing the process of thought as it occurs to the mind, and it is useful to use them for mental practice.

When a person receives a communication from another, his mind should at once perceive in every department exact ideas of the subject communicated; for example, when we are told that heat melts lead, a large amount of intelligence is conveyed. First, we have to note what lead is, and the qualities of that kind of matter which is called lead, then the state of solidity in which lead generally exists. Without a previous information having existed in the mind, the assertion would not convey any knowledge. Next, the change which occurs in a solid body in the act of melting, whereby a solid state is converted into a fluid state.

Lastly, the impressions which exist in the brain as to the meaning of the word heat. Whenever heat is manifested, a change of matter is recognised by the mind, such as the combination of coals with oxygen, in the process of combustion, or the union of zinc with oxygen, in the voltaic battery when the heat is caused by electrical action, and so on for the other physical forces which can set in motion heat.

In the use of these three simple words—heat melts lead—how vast are the impressions registered in the brain which are affected! Some aisthenic as we receive them from the external world, some syndramic or distinct images before fixed in the brain, and some abstract in the higher department of the organ of thought.

The intelligence communicated is but partial knowledge if the brain is not acted upon in its higher, lower, and middle departments, with regard to the numerous portions of intelligence conveyed by the simple words, heat melts lead.

So in the moral law, when we are told to love all men, what an extent of images already registered in the brain is mentioned! We have black men, red men, white men, tall men, short men, middle-sized men, Englishmen, foreigners, rich men, poor men, princes, and peers.

In like manner, what a number of actions are comprised in doing good, so that pleasure may be produced in the present and future, and pain avoided under every definite condition offered for our consideration in doing good.

A man in the most perfect state of receptivity, when he has a verbal communication made to him, perceives in an instant of time the laws which are affected by the words spoken, the deductions downwards to all the specific parts of

which the generalisations are made up, the inductions upwards from particular instances affected, and the side relations to all other branches of knowledge.

For a man to exemplify these noble functions, he must train his mind to act from above downwards, and from below upwards.

As an example, let us take another illustration of the mental changes which occur, to give us the idea of cause and effect.

When an image is formed on the brain from an action in the eye, it would continue the same for ever, unless something happened to change the picture; for instance, we see a picture of an apple-tree with the apple on it. The apple falls to the ground when a picture is formed, the apple is on the ground, the apple-tree appears without the apple. This change of position is the effect or result, and the mutual attraction between the earth and the apple is the cause.

Every change of picture before the mind results from some change effected on matter, such as its form, composition, creation, position. This is always the result or effect, and every result or effect must have a cause to produce the effect. Now this cause always requires some other new attraction, which acts on the matter changed to give rise to the result.

The ideas of cause and effect are the result of particles of matter changing or entering into new attractions, whereby other particles of matter are acted upon, to assume some changed state which is competent to form a new picture in the brain.

This may be termed one event composed of three stages: 1, matter in some definite form or position; 2, this matter in some other form or position; and, 3, other matter, or

even its own particles of matter, entering into a new attraction to produce the new result.

Whenever any change is presented to our mind, then we may search for the cause of that change, and we shall surely find that new attractions corresponding to the extent of that change have been set up to effect it.

This is a most important doctrine, as it teaches plainly that out of nothing nothing can come, that every effect must have a corresponding cause, and whenever we observe an effect we should search for the cause.

Sometimes when we see an effect or consequence, we see also the cause; for instance, when we observe a pile being driven by the fall of a huge block of wood by its attraction to the earth.

Again, we see the cause of water passing into steam over the fire which arises from the action of the coals entering into combination with the oxygen of the atmosphere.

Sometimes, however, we perceive a result, and do not see the change of matter which produced it. For instance, we leave a tree laden with fruit at night, and in the morning find a denuded tree. The mind immediately seeks the cause, and naturally asks, has it fallen to the ground, have the birds carried it away, or the beasts eaten it, or what is most probable, has some visitor come and taken it away? We know that according to the laws of nature that the fruit could not have gone away by itself, and the change of picture which the tree presented through the eye to the mind necessitated some other change of picture of some other matter as its cause which was unseen, because the eye was not there to see it.

The mind runs great danger in estimating cause and effect. Matter may be changed in composition, in form, or position, and simultaneously other matter be changed in

composition, or form, or position, and yet in the two sets of pictures there may be no relation between one and the other. In fact, the two results may be really only concomitant.

It is necessary in all cases that the cause should precede (even if the time be only infinitesimally small) the consequence or result. When oxygen and hydrogen are attracted together, the result or the production of water comes almost instantaneously on the new attraction being set up between the two gases, whereby the compound of water results.

As a necessity of the voltaic construction of the nervous system every combination of the sensor nerves must be opposed to every motor nerve. The whole of the sensor nerves must be so arranged that the voltaic force may pass through any motor nerve. As that combination as a whole acts to some extent when any part of the lower series acts, it follows that the idea of totality must be ever before the mind as the result of our organisation. It is in this way probably that we obtain our higher metaphysical abstractions. Thus, personality and infinity give us the idea of the soul, pleasure, and infinity of good; pain and infinity of evil, cause and infinity of God, time and infinity of eternity, infinity pleasure and time of heaven, infinity pain and time of hell. Personality and all the units of sensation give us the idea of the body; personality infinity and time, of immortality; personality and other totalities of senses give us the idea of the mind, thought and infinity of spirit. Lastly, action infinity and pleasure conjoined give us the ideas of virtue, action infinity and pain of vice.

It is not within our power to define these ideas. That which is infinite must not be limited, time must not be confounded with eternity, matter with space, the body with the soul, or material actions with God.

In all these higher considerations of our mental know-

ledge, man is apt to consider the abstractions as substantive realities. Hence it is common to hear men talk of gravity, and in former times of levity, of light, of heat, of electricity, of life, of good, of evil, as substantial existences. This is a very dangerous fallacy of the mind, as by it mankind has been led to mistake abstract ideas of certain actions on the brain for substantive realities.

Contrariwise, men perceiving that all our knowledge is derived from actions of the brain, have been led to doubt whether the external world has any substantial reality.

Both such notions are fallacious, for external matter acts on our brains, and the modes of action are grouped together, and receive general abstract names.

It is extremely difficult to write on abstract ideas, to make our thoughts intelligible. It is also extremely difficult to comprehend what others write, and chiefly because the writer is at a loss to select words which shall clearly explain his meaning, and the reader is at a loss to attach a definite meaning to the written words.

In the study of abstract ideas it would much promote exact thought if a series of words were used which should solely be employed in the higher departments of the mind, and should never be used for the lower or more elementary ideas existing in the mind.

It is not so in the lower or elementary ideas of the mind. The lower classes of literature which pander to the passions of the million graphically describe murder or other horrid scenes for those who like to dwell upon the horrible with such exactness as correctly to represent the scene to their minds; and in like manner scenes of pleasure, such as these of festivals, are satisfactorily described to those who like the ideas of joy and happiness. But probably there is scarce one in a million of persons who enjoys and

thoroughly comprehends that class of literature, who can be brought to form the smallest apprehension of the higher laws of abstract knowledge.

Meditation on the higher abstractions and the development of our general laws from experience within our own minds is productive of great and unalloyed pleasure. If conducted solely for the cause of truth, all other pleasures are but phantoms to the pure pleasure of true reason. Nevertheless its exercise cannot be carried to excess with impunity. If rest occupies one-third of our time, our inner and intimate thought should scarcely occupy two-thirds of the remainder, which should be devoted to observation, action, and refreshment. It is only by the balance of the action of all parts of the brain that the perfection of human reason can be secured.

Every human being has, and probably at every past time, unless in a state of disease, has had some power of abstraction, and, even this power in the feeblest existence constitutes a clear and distinct jump from that possessed by the mind of any of the lower animals, although there are extensive variations in degree as to the power of mind of animals, as attentive examination discloses that there is no creature without some mind, and contrariwise a very few men with the highest order of mind. It is curiously noteworthy that whenever any person of the highest order of mind appears amongst us, there is hardly a sufficient population living at the period thoroughly to appreciate his superiority, and it requires the approbation of all the great minds, who live over a series of years intelligently to do justice to the works of the highest intellects; and contrariwise, whenever a man attains to great popularity at once, it is an indication, that he possesses an average, and not a greatly superior mental power.

Every one who regards the signs of the times must per-

ceive that a great conflict is approaching between true reason and mediæval credulity, as to what is to be regarded as pure religion. Heretofore the great students of the higher branches of mental knowledge have been chiefly the promoters of religious impostures, designed to rule mankind and to control their property; but in the coming conflict their combatants will be those who study mental processes for the sake of truth.

The present position of the parties is inaction. Each side looks at each other aghast at its strength and is passive. An indiscreet partisan, now and then on either side, fires a random shot of words which have but little meaning and less effect. The fight may occur at any moment by the slightest spark. The kidnapping of a child, the seizure of a nun, the spoliation of the fortune of a silly young man, an insult to a prime minister, or to an ecclesiastic, or a fiery sermon, may fan the spark into a flame; and happy will be mankind, if the next reformation be carried by a battle of words, and not by a deadly conflict between true knowledge and pure religion on the one hand, and fanatic credulity and false religion on the other. Races seem to determine religious belief, and so religion and race may fight side by side in the coming struggle. Nobody can tell how far he may be an actor in this great coming conflict, which now overhangs every European nation, and their younger sister America. Those who rely upon rational thought and purity of mind will be best equipped for the battle, and the present position particularly requires a study of the higher domain of thought.

The ground lines of every department of knowledge are in chaos, but if Nature is interrogated in a spirit of earnestness *and truth, and if men are determined to have true* knowledge and a pure religion, they will surely be rewarded for their labours.

To illustrate the probable construction of the nervous system, the two following maps have been made to show the general mode in which the nerves are distributed to the muscles and organs of sensation on each side of the body; and further, how the nerves of both sides pass through the brain, and are there interlaced before the nervous power acts through the muscles.

Complicated as the nervous system appears in these two very general maps, yet even more complicated must it exist in reality. For some purpose not clearly understood, the nervous fibres on one side of the body are carried over from the opposite side of the brain, and thus, if the right side of the brain is injured by disease, the left limbs are paralysed, and not those of the side injured; and this curious and complicated mechanism would have to be added to that indicated in the maps.

It is worthy of special remark that our organs of sensation are double, so that when one is injured the other is available, just as engineers put up two steam-engines and two steam-boilers where constant work is required; but yet it is so beautifully contrived that when the two organs are at work they afford more perfect information than either would separately—a fact which we have already particularly indicated with respect to binocular vision, and which has contrivances in the decussation of the optic nerves.

As the organs of sensation are double, so are the most important parts of the brain double, the two halves being connected by great commissures of nervous fibres, so that the organ as a whole is one, whilst the parts are two.

As thought is very exhaustive to the system, there appear to be special contrivances to enable ordinary movements *to be made in a more or less automatic manner* without their being subjected in all their detail to the exhaustive process of thought.

BIO-TELEGRAPHS, SENSOR NERVES. PERIPHERAL BATTERY.

AISTHENICS.

Right Side.		Left Side.
ELECTROLYTE.		ELECTROLYTE.
Eye		Eye
Ear		Ear
Nose		Nose
Tongue		Tongue
Skin		Skin
Mechanism of Bodily Sensation.		Mechanism of Bodily Sensation.
POSITIVE.		POSITIVE.

PERIPHERAL BIO-TELEGRAPHS, BATTERY. SENSOR NERVES.

CENTRAL BATTERY, OR BRAIN.

PHRENO-AISTHENICS.

Units of Sensation.		Units of Sensation.
NEGATIVE.		NEGATIVE.
ELECTROLYTE.		ELECTROLYTE.
POSITIVE.		POSITIVE.
Units of Sensation.	**Commissure.**	**Units of Sensation.**

SYNDRAMICS.

Combination of Units of Sensation.		Combination of Units of Sensation.
NEGATIVE.		NEGATIVE.
ELECTROLYTE.		ELECTROLYTE.
POSITIVE.		POSITIVE.
Combination of Units of Sensation.	**Commissure.**	**Combination of Units of Sensation.**

AISTHENIC-NOEMICS.

Totality of Combinations of each Sense.		Totality of Combinations of each Sense.
NEGATIVE.		NEGATIVE.
ELECTROLYTE.		ELECTROLYTE.
POSITIVE.		POSITIVE.
Totality of Combination of each Sense.	**Commissure.**	**Totality of Combination of each Sense.**

SYNDRAMIC-NOEMICS.

Combination of Totality of each Sense.		Combination of Totality of each Sense.
NEGATIVE.		NEGATIVE.
ELECTROLYTE.		ELECTROLYTE.
POSITIVE.		POSITIVE.
Combination of Totality of each Sense.	**Commissure.**	**Combination of Totality of each Sense.**

PNEUMA-NOEMICS.

Totality of Combinations of Totalities of each Sense and both Sides.

NEGATIVE.
ELECTROLYTE.
POSITIVE. POSITIVE.

CENTRAL BATTERY, OR BRAIN.

BIO-TELEGRAPHS, MOTOR NERVES.

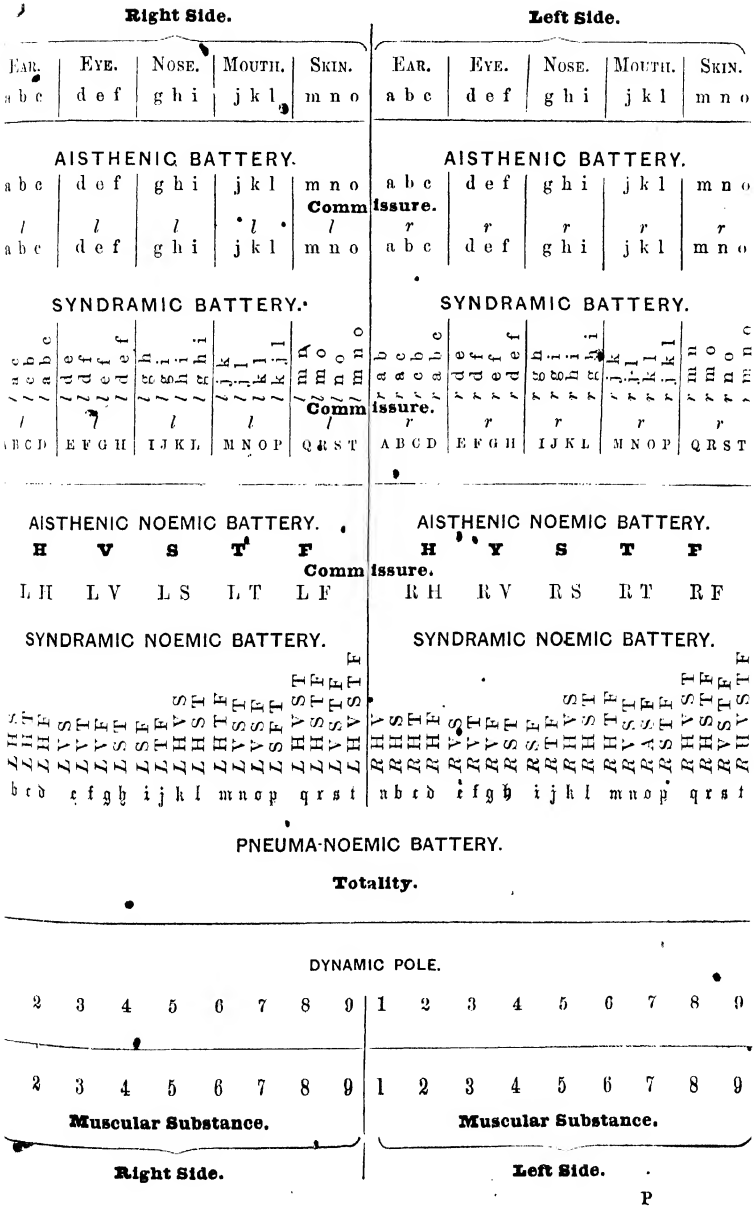
PERIPHERAL BIO-TELEGRAPHS, BATTERY. MOTOR NERVES.

DYNAMICS.

NEGATIVE.		NEGATIVE.
Muscle.		**Muscle.**
ELECTROLYTE.		ELECTROLYTE.
Right Side.		**Left Side.**

PERIPHERAL BATTERY.

NERVO-VOLTAIC MAP (No. 2).



CHAPTER XV.

VOLTAIC MECHANISM OF THE NERVOUS SYSTEM.

Nervous system a voltaic circuit—Essentials of a voltaic circuit—Single voltaic circuit—Compound circuit—Simple nervo-voltaic circuit—Hypothetical arrangement of the brain of animals—of man as a voltaic apparatus—Actual general structure of the brain—Professor Ferrier's researches—Microscopic structure—Termination of nervous fibres in the organs of sensation in the body—in the muscular system—Terminations of the nerves in the brain and spinal chord—High vascularity of tissues where nerves arise and terminate—Various artificial voltaic circuits—Electric fish.

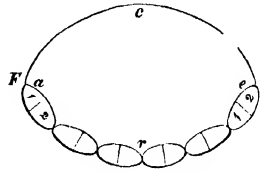
The voltaic construction of the nervous system is confessedly difficult to be appreciated by the mind, because on the one hand a voltaic battery has to be understood as a whole, and on the other any voltaic apparatus in organised beings must be composed entirely of organic and fluid matters, and not of metallic plates with intervening fluid.

It is essential to every voltaic circuit that it should consists of a compound fluid which must be a conductor of electricity, and this it is not, unless it be capable of separation into its component parts. In the action of a voltaic battery, one element of the fluid is evolved at one place, the second at another place; and it is necessary that the two points of decomposition should be connected together as in the following diagram (fig. 11).

The above arrangement is an example of a single battery, but two or more batteries may be conjoined together to form a compound battery, as in fig. 12.

All batteries in animal bodies are compound batteries, one battery being in the body, the other in the brain; and, moreover, it is not only a compound battery, but is also one in which its fibres interlace in a wonderfully complex manner only to be apprehended by the mind by the closest attention and the most careful study of all the parts.

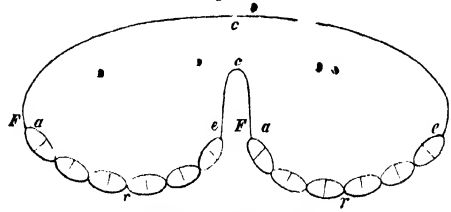
Fig. 11.



Single voltaic circuit. *F*, Point at which new combination occurs with (1) one element of electrolyte, *r*; *e*, point of evolution of second element (2) of electrolyte; *c*, conductor by which circle is completed.

The most simple idea of a voltaic element in the nervous system would be obtained by a circle of one motor nerve and one

Fig. 12.



Double voltaic circuit.

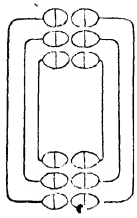
sensor nerve (fig. 13), the termination of one end of the sensor nerve being situated in the organ of sensation in the body, in aqueous matter in the tissues, and one end of the motor nerve being in contact with aqueous matter in the muscle. The other extremities of the two nerves are inserted in the moist tissue of the grey matter of either the brain or spinal chord, the two connecting nerves being insulated conductors, similar to the wires of our telegraphs, except in this respect, that the interior of the nerve fibre consists of fluid, whilst the connexions of telegraphs are made of metal.

Fig. 13.

Single nervo-voltaic circuit.

Passing from the consideration of this simplest possible case, we may study a group of three sensor nerves arising from an organ of sensation and passing to the brain, and three motor nerves arising in the brain and passing back to complete the voltaic circuit to the muscles in the body (fig. 14).

Fig. 14.

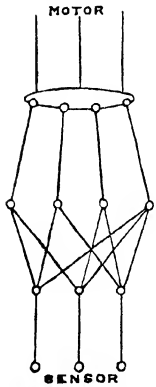


Triple nervo-voltaic circuit.

The above simple elementary voltaic circles would be of no use by themselves, for it is necessary that the voltaic apparatus in the brain should have a regulating influence to determine what motor fibrils are to be active.

For this purpose, we may assume, that the nervous terminations in the brain enter into combinations somewhat after this diagram (fig. 15). By this arrangement the excitement of any one sensor nerve, or of any combination of sensor nerves, may influence any motor nerve, or any combination of motor nerves in the body.

Fig. 15.



Three nerves in combination.

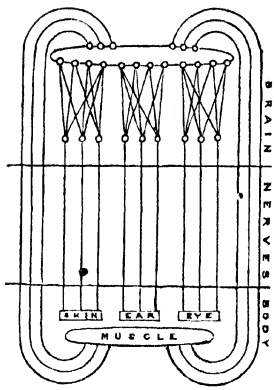
From my experiments in voltaic electricity, I found as a general law, with small quantities of electricity at low tension, that the voltaic force practically passed by the road of least resistance to the exclusion of all the rest. According to this law the action of the particular motor nerve is determined.

The brain, therefore, is the mechanism by which the particular direction of the voltaic current is regulated, not only according to the immediate sensor nerves excited, but from all preceding actions which have occurred in the brain.

By the combinations of nervous fibrils the different pictures carried to the brain are registered: thus, if we have three fibrils, A B C, we have either A excited, or B, C, A B, A C, B C, or A B C. In practice, we do not form even a single image in the brain without hundreds or even thousands of nervous fibrils being excited, so that in nature a mental image is a very complicated phenomenon.

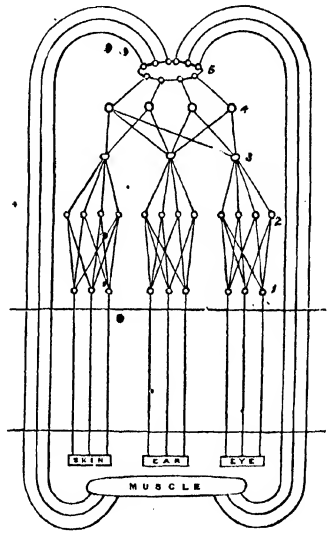
Considering the more simple phenomenon of mental action amongst the lower animals, we may assume a more simple structure than that of man. Such a simple form might be represented by the following diagram of three fibrils of each of the three more important organs of sensation (fig. 16).

Fig. 16.



Theoretical nervous combination of lower animals.

Fig. 17.



Theoretical nervous combination of man. 1, Aisthenic; 2, syndramic; 3, aisthenic noemic; 4, syndramic noemic; 5, pneumanoomic.

When, however, the mind of man is considered, we may expect that the combinations are of a more complicated con-

Fig. 18.

1. Anatomy of the brain of man, after Mayo. Spinal cord, *f*; posterior columns of spinal chord into which the sensor nerves are implanted, and which are continued into the cerebellum, *B*; from the cerebellum, fibres are continued to the corpora quadrigemina, *k*, *l*; Other fibres are continued from the spinal chord through the olivary bodies, *c*, by the olivary fasciculus, *h*, which are continued to the cerebrum, *c c c*. From the cerebrum fibres converge to the pons, *n*, and from this point the fibres of the fasciculus of the spinal chord spring, and from which bundles the motor nerves arise (half diameter).
2. Representation of the fibres and cells in the grey matter of the brain.
3. Nerve fibre showing its insulatory character.

struction to provide for those higher abstractions, which it is the sole faculty of man to exhibit, and the diagram shows in the simplest manner how such abstractions might be formed.

It must also be taken into consideration, that the human frame is composed of two symmetrical halves, so that the fibrils of each half are combined together in such a manner, that the nerves of one half, as a general rule, influence every motor nerve not only of its own side, but every motor nerve of the other half of the body also.

This complexity of structure I have in some degree attempted to indicate in the two nervo-voltaic maps (pp. 208, 209), which I have arranged; firstly, that each sensor nerve should be represented in the brain (aisthenic); secondly, that the sensor nerves should be grouped together in combinations (syndramic); then the principal syndramic should be combined together (noemic), and the noemic end in one terminal group (pneuma-noemic).

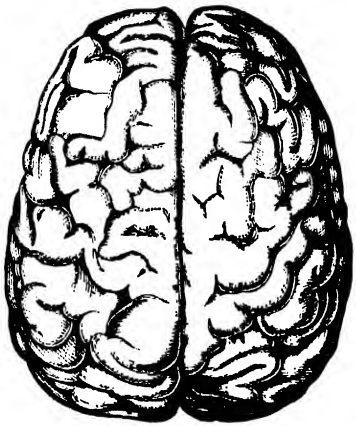
Such a scheme necessarily involves a vast structure of fibres in the brain, and, when we inspect the brain, we perceive clearly that a vast combination of nervous fibres really exists. Perhaps the best rough dissection of the brain was made many years ago by Herbert Mayo, a former Professor of Physiology at King's College, as it shows how the great mass of fibres pass upwards from one part of the brain to another, and have their terminations in the enormous extent of grey matter contained in the cerebral hemispheres (fig. 18). Notwithstanding the extraordinary complexity, which is revealed by this mode of examining the brain, it is plain that every possible combination of nervous fibres does not exist, for vast as the brain is it would not suffice for so extensive a mechanism. It is probable, therefore, that nature

has made a selection of combinations of nervous fibrils, which lead to definite actions.

To discover the exact course of the nervous fibres within the structure of the brain and spinal chord requires skill and high microscopic power.

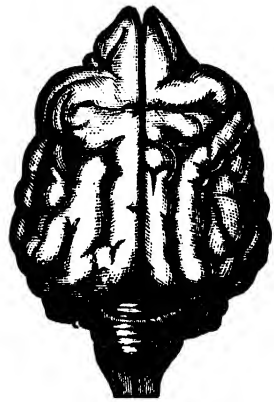
The convolutions of the cerebrum in man (fig. 19) are

Fig. 19.



Convolutions of cerebrum of man.

Fig. 20.



Brain of the dog.

more extensive than those of any other animal, though the weight, relative to the weight of the body, is not greater than that of some other animals.

The brains of the lower mammalia have a cerebrum not so extensive as that of man, and which does not, with hardly any exception, overlap the cerebellum (fig. 20).

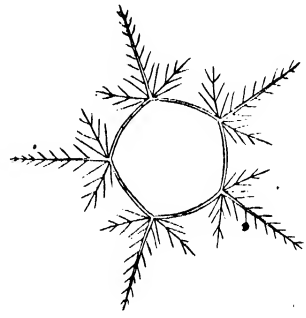
In all the lowest animals the nervous system is much less elaborate than that of the vertebrate animals, as may be observed in the nervous system of star-fishes (fig. 21).

The higher vertebrate animals, as man, the monkey, the cat, the dog, have the convolutions of the cerebrum more or less developed. The rodent animals and birds have a smooth

cerebrum, and have not so great an extent of grey matter. These convolutions of the brain are named by anatomical writers, and particular functions have been assigned to each portion of convolution.

Dr. Ferrier has especially experimented on this subject, and he stimulated various portions of the brain by electricity, when defined movements occurred in the limbs according to the portion excited to action. Although we must not assign an undue importance to these experiments, they are of value, as showing, that the combinations of certain portions of the brain lead, when excited, to definite actions, although we are hardly at present able fully to estimate the results.

Fig. 21.

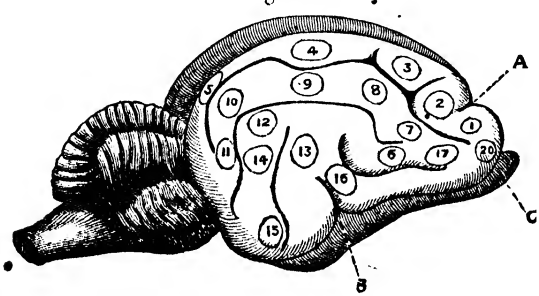


Nervous system of star-fish.

I am indebted to Dr. J. Crichton Browne for permission to use the woodcuts employed in the reports of the West Riding Lunatic Asylum, to illustrate Dr. Ferrier's researches.

'In a cat, the application of the electrodes at point 2

Fig. 22.



Side view of brain of cat:—A, crucial sulcus dividing anterior convolutions; B, fissure of Sylvius; C, olfactory bulb.

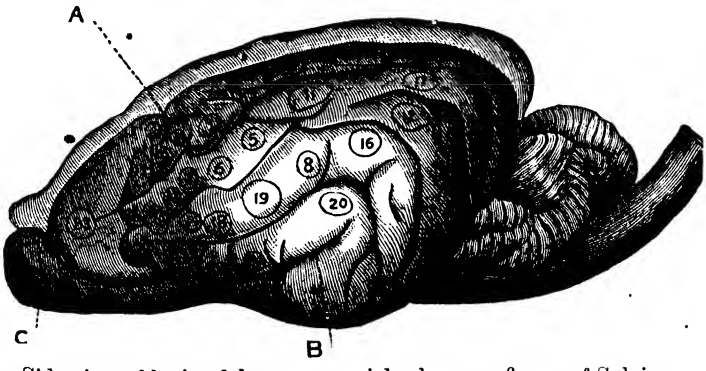
(Fig. 22) caused "elevation of the shoulder and adduction of

the limb, exactly as when a cat strikes a ball with its paw;" at point 4, "immediate corrugation of the left eyebrow, and drawing downwards and inwards of the left ear;" at point 5, "the animal exhibits signs of pain, screams and kicks with both hind-legs, especially the left, at the same time turning its head round and looking behind in an astonished manner;" at point 6, "clutching movement of the left paw, with protrusion of the claws;" at point 13, "twitching backwards of the left ear, and rotation of the head to the left and slightly upwards, as if the animal were listening;" at point 17, "restlessness, opening of the mouth, and long-continued cries as if of rage or pain;" at point 18 (on the under side of the hemisphere, not shown in the figure), "the animal suddenly starts up, throws back its head, opens its eyes widely, lashes its tail, pants, screams, and spits as if in furious rage;" and at point 20, "sudden contraction of the muscles of the front of the chest and neck, and of the depressors of the lower jaw, with panting movement." Similar results were so constantly obtained, with variations obviously depending upon the degree of excitability and the strength of the stimulus, that the localisation of the centres of these and other actions was placed beyond doubt; the movements of the paws being centralised in the region between points 1, 2, and 6; those of the eyelids and face between 7 and 8; the lateral movements of the head and ear in the region of points 9 to 14; and the movements of the mouth, tongue, and jaws, with certain associated movements of the neck, being localised in the convolutions bordering on the fissure of Sylvius (B), which marks the division between the anterior and middle lobes of the cerebrum—the centre for opening the mouth being in front of the under part of the fissure, while that which acts in closure of the jaws is more *in* the fissure.

'A similar series of experiments on Dogs gave results that closely accorded with the foregoing.

'Thus when the electrodes were applied at point 9 (Fig. 23), "the tail was moved from side to side, and ultimately became rigidly erect;" within the circle 10, the application "elicited only cries, as if of pain;" at point 14 a continued application gave rise to the following remarkable series of actions:—"It began with wagging of the tail and spasmodic twitching of the left ear. After the cessation of the more violent spasms, the animal held up his head, opened its eyes wide with the most animated expression, and wagged its tail in a fawning manner. The change was so striking, that I and those about me at first thought that the animal had completely recovered from its stupor. But, notwithstanding all attempts to call its attention by patting it and addressing it in soothing terms, it looked steadfastly in the distance with the same expression, and continued to wag its tail for a minute or two, after which it suddenly relapsed into its previous state of narcotic stupor." The application of the electrodes to point 21 produced "drawing back of the head and opening of the mouth,

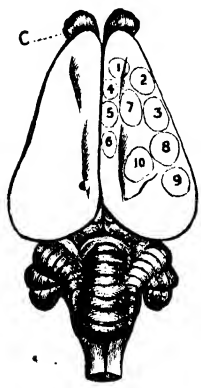
Fig. 23.



Side view of brain of dog.—A, crucial sulcus; B, fissure of Sylvius; C, olfactory bulb.

with a feeble attempt at a cry or growl (the animal very much exhausted). Repeated applications of the electrodes to this point and its neighbourhood caused whining and growling noises," like those which a dog makes in its sleep, and which are supposed to indicate that it is dreaming.

Fig. 24.



Upper surface of brain of rabbit:—A, cerebrum; B, cerebellum; C, olfactory bulb.

'Similar experiments having been made upon rabbits, the results were again as accordant as it would be fair to expect; especially considering the difficulty in exactly localising the different centres, which arises from the absence of the landmarks afforded by the convolutions. It is curious that in this animal the centres of the mouth-movements seem to be the most highly developed; when these (2, 7, Fig. 24) are electrified, "there are munching movements of the upper lip, and grinding of the jaws, as if the animal were eating vigorously."'

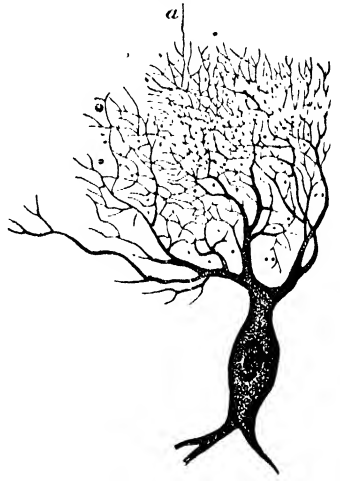
In an important lecture delivered at the London Institution, Professor Ferrier detailed the results of his experiments on the monkey, which he now proposes further to elucidate, but which I need not further describe at the present moment.

Professor Ferrier has further demonstrated that in the deeper parts of the brain the excitement of the corpora striata led to violent muscular movements, while that of the thalami optici produced no movements. Excitement of the cerebellum was followed by effects which led to the belief that it was in some way connected with the co-ordination of the movements of muscles. At the present time we are hardly in a position to tell the exact extent of the knowledge which the experiments of Professor Ferrier may teach us, though

it is believed that when electricity of lower tension is employed he will elucidate in an important manner the functions of the brain.

The grey matter of the brain is evidently the part where the mental processes are carried out. It is the active part of the organisation. The white matter is evidently solely for the nervous fibres which carry the impressions, and is strictly similar to groups of gutta-percha covered wires. In the grey matter of the brain exist the small cells which receive the impressions from the external world, which are there registered, and appear again to the mind by the act of memory. The convolutions of the cerebrum especially appear to contain the grey matter where many ideas are fixed, and which contain impressions which lead to many definite actions. I have estimated the nerves of sensation at about 100,000, but it is impossible that every possible combination could be represented in the brain, as the cells which would be required would require thirty figures to represent the number. It is apparent, therefore, as has been already suggested, that all could not be contained in the grey matter of the brain, and thus we may infer that nature has made a selection of those pictures best adapted for our wants. Probably nothing can afford us a more wonderful exhibition of the nerve-fibres of the grey matter than the accompanying diagram from Stricker of

Fig. 25.



Plexus of nerves from spinal marrow. *a*, Nerve tube communicating with plexus.

a nerve plexus from the grey matter of the spinal marrow (fig. 25).

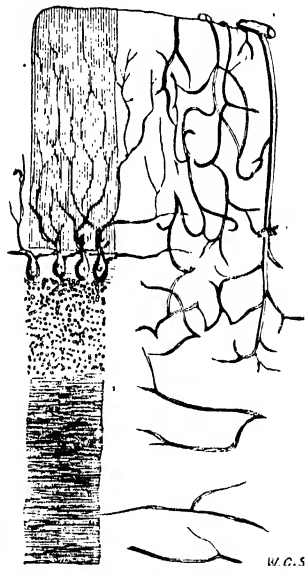
The limitation of the number of combinations leads to the conclusion that a certain combination of sensor impressions produces a definite combination of movements through the motor nerves. The term reflex action is given to such movements which may be regarded as purely automatic. The word is so dangerous that I have not before used it in this book; because if it be limited to cases which are so purely automatic that the brain as a whole—that is to say, the mind—does not exert any influence, then there are, comparatively speaking, hardly any reflex movements; and if the word is extended to cases where the automatic movements are strong, yet more or less regulated by the mind, then they would be so numerous as to involve the greater part of our actions. From the confusion of thought which the term reflex is likely to produce, from its being a mere variation of degree in which the actions are at one time reflex, at another regulated by the mind, the word should be either abolished or strictly limited to cases where mental action cannot at any time be detected, and if there are no such cases, then to such automatic actions where the least possible amount of mind is ever concerned. By these prearranged movements, nature has doubtless effected an enormous saving of brain-power. At the present time it is highly important to form a distinct idea of what we understand by reflex action, as it is not impossible that Professor Ferrier's experiments will lead some persons to extend unduly reflex action to cases considerably beyond their legitimate bearing. With our present vague idea of the term reflex action, almost every movement may be described as reflex; and, contrariwise, scarcely any movement may be

placed in the same catagory, according as we define the words.

The terminations of the nerves centrally in the brain are in the grey matter, which is abundantly supplied by blood-vessels. The nervous tubes terminate in contact with cells, in which probably the changes occur which cause the registration of impressions of the external world, and from which their reappearance occurs to constitute the act of memory. (Fig. 18, No. 2, page 214.)

I am indebted to Dr. Stewart of Thomas's Hospital for the accompanying drawing showing the distribution of the blood-vessels vertically into the substance of the grey matter of the cerebellum, and also of terminations of the ultimate nervous fibres in the same substance. (Fig. 26.)

Fig. 26.



Cerebellum showing the blood-vessels on the right-hand side descending vertically into the grey matter, and on the left the nerve cells, with nerve fibres diverging from them.

The nerves which convey the impressions to the brain, and the voltaic force from the brain to the muscles, are like metallic wires coated with gutta-percha. They consist of tubes hollow in the inside, and coated with a non-conducting fatty substance. (Fig. 18, No. 3.) Numbers of primitive fibres are grouped together in a manner similar to a group of coated wires, as used for electro-telegraphy. (Fig. 27.)

The white matter of the brain consists of nervous tubes, which run from one part of the brain to another, to form that wonderfully complicated structure, by which images are combined together in the syndramic and noemic batteries.

Fig. 27.

Ultimate nervous fibres of the sympathetic nerve, highly magnified.

The termination of the nervous fibres in the body has been particularly the subject of investigation, and it is very difficult to make them out in a thoroughly satisfactory manner, because the tissues demand special processes of preparation, and a very high power of microscope for their examination. To render their appearance intelligible, they require to be magnified 500 to 800 diameters. Perhaps the best modern account is to be found in Stricker's 'Human and Comparative Histology,' which has been translated by the new Sydenham Society.

Fig. 28.

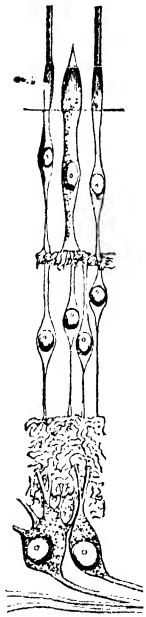


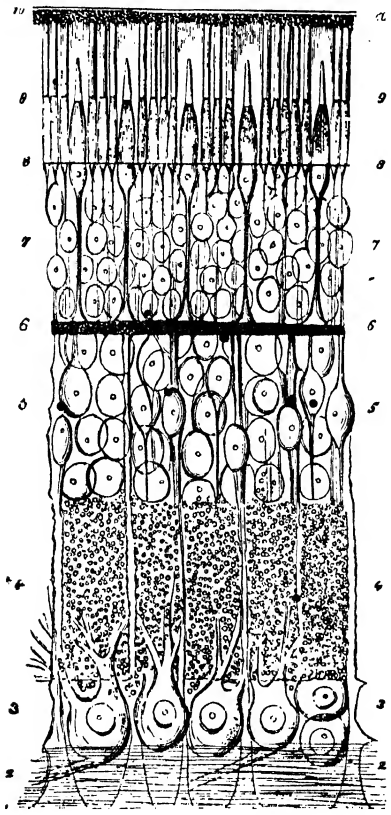
Diagram of nervous fibres of retina, after Stricker.

In the eye there is a curious apparatus of rods and cones, but there is very great uncertainty as to their exact mode of action, from their very small size. The following diagram from Stricker may serve in some manner to demonstrate this structure in the eye. (Fig. 28.)

I am much indebted to the kindness of Mr. Jonathan Hutchinson, the secretary to the New Sydenham Society, for lending me some of the engravings from Stricker's invaluable manual of human and comparative histology which

demonstrate the mode of termination of the nerves of the organs of sensation. The following is a beautiful diagram of the layers of the retina of man, magnified 400 diameters (fig. 29).

Fig. 29.



General view of the layers of retina of man. 1, Membranum limitans internum. 2, Optic fibre layer. 3, Ganglia cell layer. 4, Internal granulated layer. 5, Internal granule layer. 6, External granulated layer. 7, External granule layer. 8, Membranum limitans externum. 9, Layer of rods and cones. 10, Pigment layer.

Dr. Stewart has kindly made for me a diagram of the

ultimate nervous fibres, as distributed to the skin. The diagram shows the curious corkscrew conduits of the perspiratory glands, and the fine net-work of nerve-fibres, as well as the termination of the nerves in the papillæ. (Fig. 30.)

Fig. 30.

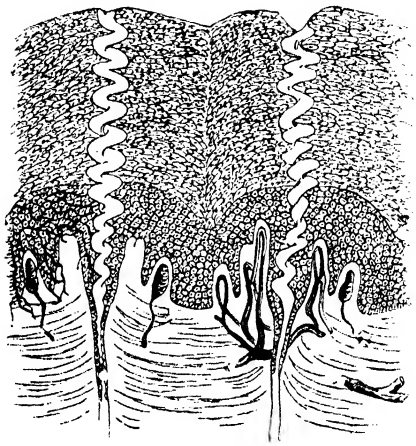


Diagram of the minute anatomy of the skin.

The termination of the auditory nerves is very remarkable. The nerves terminate in cells, and to these, fine auditory hairs are attached (fig. 31).

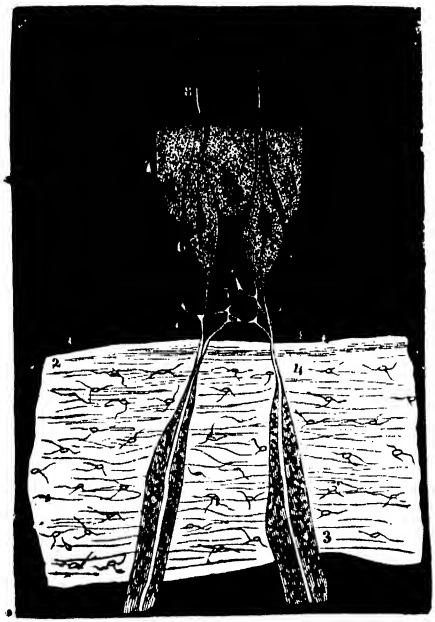
Engelmann has given a good figure in Stricker's work of the termination of the gustatory nerves of the frog. It shows the ramification of a nerve-fibre in the nerve area, and a group of two goblet cells, one columnar and two forked cells (fig. 32).

Professor Babuchin has figured the terminations of nerves in the nose in the epithelia layer (fig. 33).

The circle of the nervous system is completed through the muscles. These are composed of ultimate muscular fibrils, contained in a sheath or envelope, called the sarcolemma. The

nerves are distributed to the outside of this sheath (fig. 34); and when the nervous power acts through the muscles, they swell transversely and contract longitudinally. The precise chemical change which takes place in the sarcous tissue during action is not exactly known; but from the extensive waste which occurs during hard work, we might expect, but

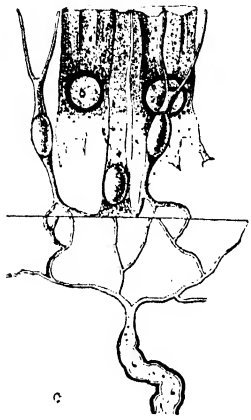
Fig. 31.



Termination of the auditory nerve. 1, Cartilage of the wall of the ampulla. 2, Structureless basement membrane. 3, Doubly continued nerve-fibre. 4, Axis cylinder traversing the basement membrane. 5, Plexiform union of nerve-fibres with interspersed nuclei. 6, Fusiform cells with nucleus and dark fibre in their interior. 7. Supporting cells. 8, Auditory hairs highly magnified, after Stricker.

not necessarily, that the muscles act as the positive pole of the whole circuit. To determine this fact, it will be necessary to ascertain if the sarcous tissue combines with oxygen or hydrogen when it contracts. I have imitated the action

Fig. 32.



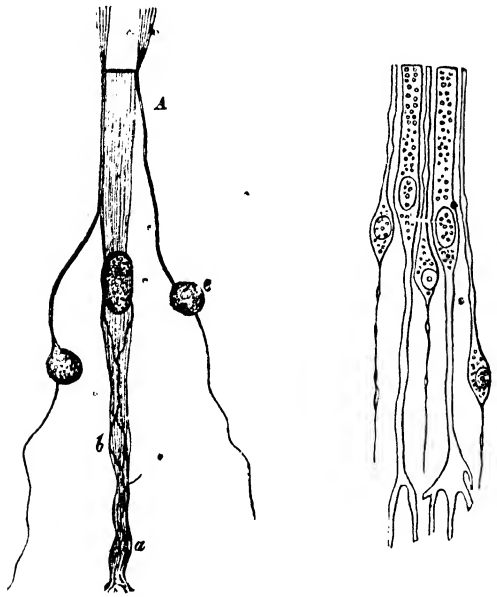
Termination of the gustatory nerve of the frog, magnified 600 diameters.

of muscle by a portion of gut, which when distended contracts in length, but increases in breadth (fig. 35), on its being distended with gas.

The terminations of the sensor as well as the motor nerves in the body are always in a highly vascular tissue, and their other terminations in the grey matter of the brain and spinal chord are also in a highly vascular tissue.

Unquestionably the oxygenated bright arterial blood cor-

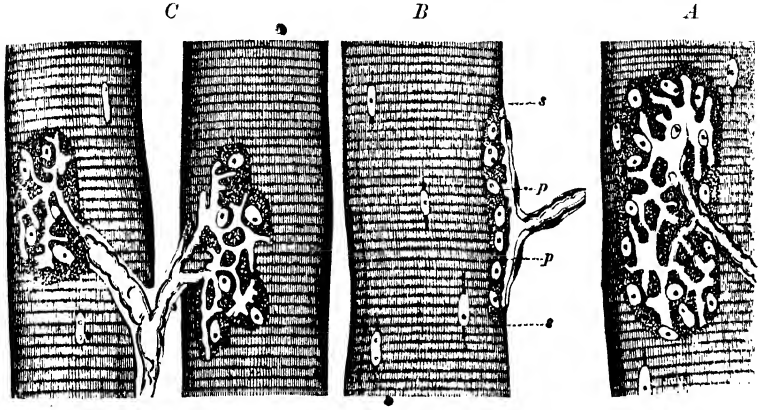
Fig. 33.



Terminations of olfactory nerve. *A, a*, Epithelial cells from the olfactory region of the proteus; *d*, the processes apparently connected with them; *e*, olfactory cells; *B*, epithelium and olfactory cells from man,

puscule plays an important part in supplying the oxygen to favour chemical action, to set in motion the voltaic electricity at the positive pole, and also the arterial corpuscule plays an

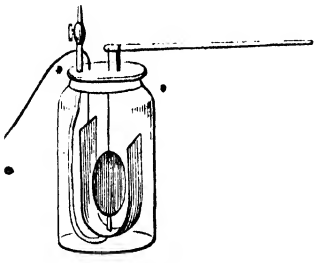
Fig. 34.



Distribution of nerves on muscle, after Stricker. *A*, seen in profile: *p p*, terminal nerve plate; *s s*, support of the plate with nuclei. *B*, the same in fresh muscle. *C*, the same after death.

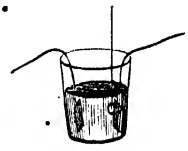
equally important part in combining with the hydrogen to assist the voltaic circuit at the negative pole. It is peculiarly

Fig. 35.



Artificial muscle.

Fig. 36.



Artificial blood corpuscle.

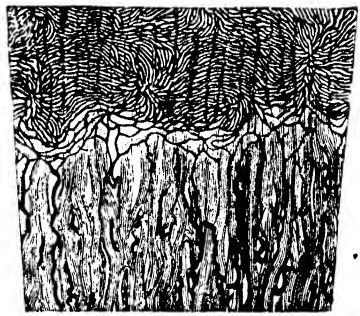
the property of iron compounds to take oxygen when lowly oxydised, and to part with oxygen when highly oxydised.

An artificial blood corpuscule may be made by placing a little persalt of iron in an animal membrane. On placing

this in a neutral apparatus arranged for a voltaic circuit, as two poles of iron in a saline solution, a voltaic circuit is immediately completed (fig. 36).

The vascular tissue of the organs of sensation of the body has been the subject of examination by many authors. In the eye there is a layer of blood-vessels called the choroid, which is an intricate network of arteries and veins (fig. 37).

Fig. 37.



The centre of vision is marked by a yellow spot containing much yellow pigment (fig. 38).

Fig. 38.

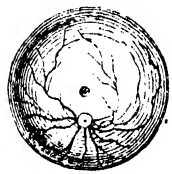
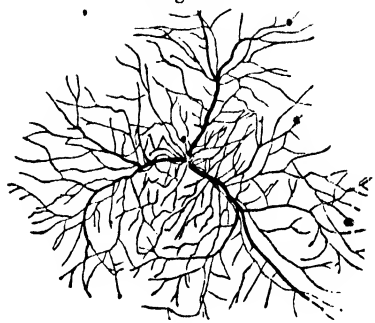


Fig. 39.



Artery of the retina.

The so-called artery of the retina is probably not for any purpose of vision, but for the nutrition of the humours of the eye (fig. 39).

The membrane lining the internal ear is also highly vascular, and the following engraving is from one of my own carmine injections (fig. 40).

Fig. 40.

Blood-vessels of ear.

Fig. 41.

Blood-vessels of nose.

The vascular membrane of the nose has an arrangement of vessels different from that of the eye or ear (fig. 41).

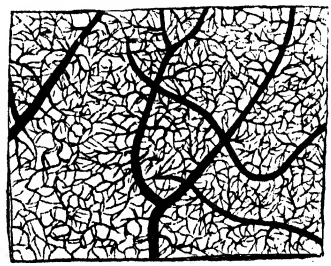
The tongue has again a particular arrangement of vessels (fig. 42) of its own.

Lastly, the skin has a vascular tissue with a different distribution of vessels from any of the other organs of sensation (fig. 43).

Fig. 42.

Blood-vessels of tongue.

Fig. 43.



Blood-vessels of skin.

The distribution of blood-vessels in the muscular system is peculiar, as the main vessel enters at right angles to the

muscular substance, and the capillary vessels are arranged parallel to the muscular fibres (fig. 44).

Fig. 44.

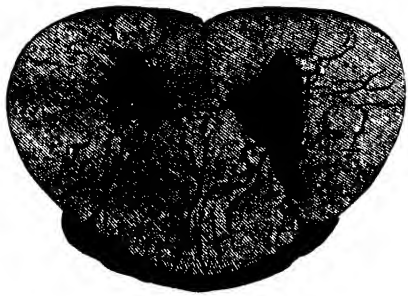
Blood-vessels of muscles.

The arrangement of the blood-vessels of an organ appears to be determined by convenience, according to its entire structure.

However vascular may be the tissues existing in the body in which the nervous fibres terminate, yet the grey matter of the brain and spinal chord exhibits a greater complexity of capillaries.

This was made especially the subject of investigation by

Fig. 45.



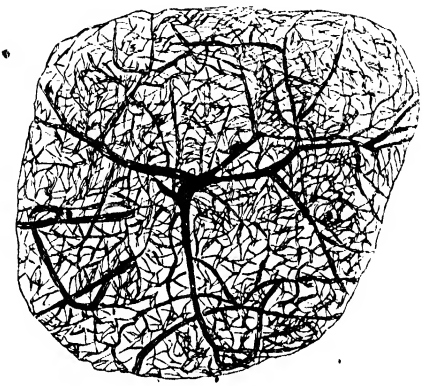
Blood-vessels of spinal chord.

myself by the process of injecting with carmine. The grey matter of the spinal chord had never been injected before in

so perfect a manner, and the grey matter exhibits when injected the elaborate system of blood-vessels in the tissue where the ends of the nerves are implanted (fig. 45).

Throughout the entire brain the process of injecting by carmine, demonstrates the intense vascularity of the grey matter. The grey matter of the cerebrum (fig. 46) is most beautiful when injected, and exhibits its innumerable vessels, and the grey matter of the lobes of the cerebellum shows its network of vessels (fig. 47) in the grey matter.

Fig. 46.



Blood-vessels of grey matter of cerebrum.

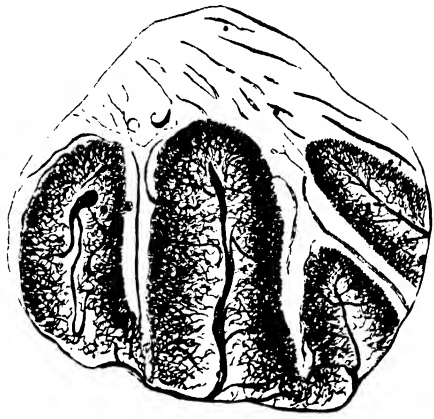
The late Sir Robert Peel lingered over the preparation for a long time with intense delight, at a *soirée* at which I was exhibiting it under the microscope. He then sought out Guizot, and both remained descanting upon the wonderful plexus of vessels and large amount of blood required to carry on thought in the brain, and both expressed themselves as deeply impressed with the marvellous structure thus revealed (fig. 47).

Whilst prosecuting my researches I discovered the very singular fact that the circulation of the corpuscules of the blood was instantly arrested by the voltaic force, and what

is even more remarkable, that the lymph corpuscules which crawl along by the walls of the vessels have in the same manner their motion arrested by the same force. This opens up a large field for inquiry as it demonstrates that the circulation of the blood is controlled by the nervous power, a fact which is also proved by the rise in temperature when the nerves of any part are cut.

The waste of matter which occurs in the action of the nervous system must be alike in every battery, that is at

Fig. 47.



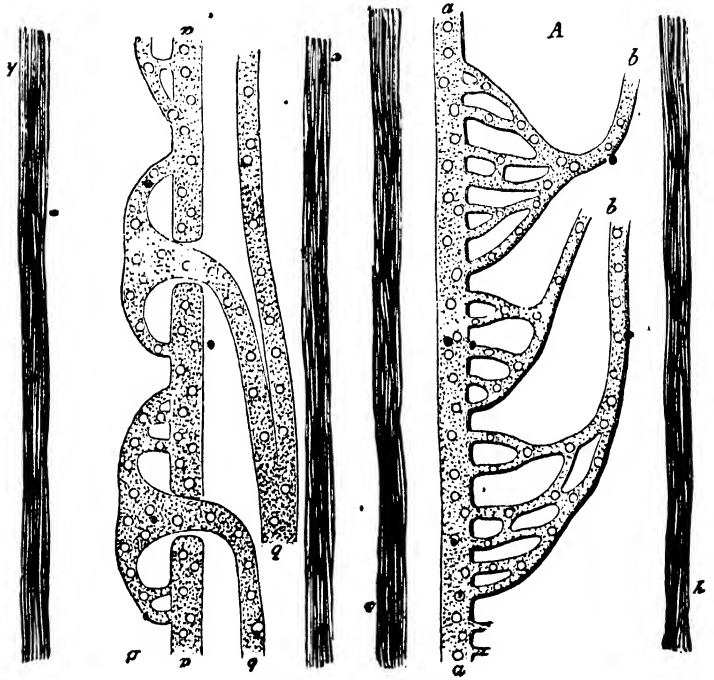
Blood-vessels of cerebellum, showing the vessels are almost exclusively in the grey matter.

every termination of the nerves; for instance, if a certain quantity of water is decomposed in the body, a similar quantity must be decomposed in the brain, hence mental action is attended with much exhaustion. We are not, however, in a position to state what are the precise changes of matter which take place either in the brain or in the body, by which the voltaic force is determined. The flow of arterial blood through the brain and the immediate suspension of con-

sciousness when its circulation is stopped demonstrate the necessity of the afflux of bright arterial oxygenated blood, and also for the removal of the deoxygenated venous blood.

Of all the distinct exhibitions of the voltaic force in living animals, none surpasses or even equals that which is

Fig. 48.

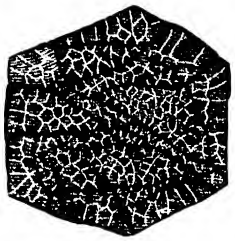


A, From the electric organ of Mormyrus oxyrhyncus, and also in the M. longipinnis and cyprinoides; *v*, anterior, and *h*, posterior connective tissue septum; *a a*, electric plates; *b b*, nerves penetrating into their interior. *B*, From the electric organ of Mormyrus dorsalis, and also as in the M. anguilloides, lettering as in *A*.

produced by the electrical eel and electrical ray. These fish have the power at will of giving the most formidable electric shocks by means of batteries which they possess for

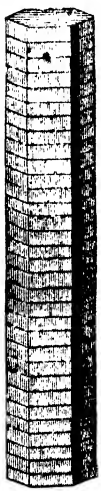
that purpose. These batteries are composed of cells largely supplied by nerves and blood-vessels. At will the creature can charge these batteries, when they inflict injury or death by their terrible electric shock. The creature has to expend considerable nervous power in charging the battery, and soon becomes much exhausted in the attempt. The precise mechanism is unknown, but if one plate of the cell was furnished with arterial and the other with venous blood sufficient effect would be produced, in series, from that cause alone, as my experiments have proved, and the nervous force might effect this change or some similar analogous change.

Fig. 49.



Single battery cell, from a model in Hunterian collection.

Fig. 50.



A series of batteries, from a model in Hunterian collection.

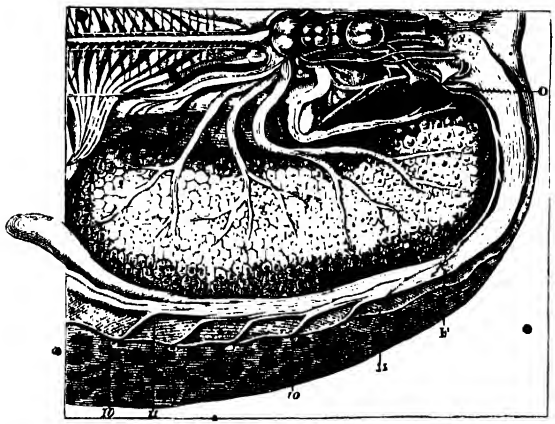
There is one fact about all these electrical fish, which is worthy of all attention, and that is, the production of large quantities of electricity by batteries, composed entirely of fluids and animal membranes, —a condition essential in the general voltaic mechanism of the nervous system. Max Schultze has figured the terminations of the nerves in the electrical plates (fig. 48).

In the electrical rays, found chiefly in the Mediterranean, the batteries are composed of a series of hexagonal cells arranged (figs. 49 and 50) on each side of the head from above downwards, that is, from the upper surface of the fish to its under surface.

The electrical organ is well supplied with blood (figs. 51

and 52), and has a large distribution of nervous force from

Fig. 51.



Torpedo viewed from above, showing the brain and the enormous distribution of the eighth pair of nerves to the electric organ. 11, Muciferous organs; 10, openings of muciferous organs in skin.

Fig. 52.

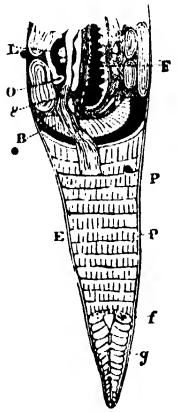
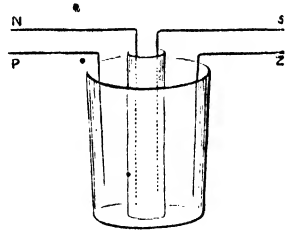


Fig. 53.



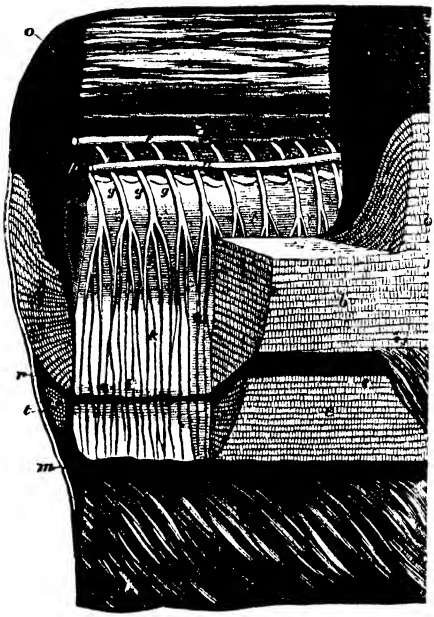
Artificial electrical fish-cell.

Transverse section of torpedo; F, electric organs; P P, vertical prisms of battery; 8, eighth pair of nerves to supply batteries; L, electrical lobe; O, ear; F, mouth; *g*, muscles of extremity; *f*, follicular organs.

the eighth pair of nerves, which are of prodigious size, and also from a portion of the fifth pair of nerves.

I have in a remote manner attempted to imitate a cell of an electric fish, by using a solution of prussiate of potash in

Fig. 54.

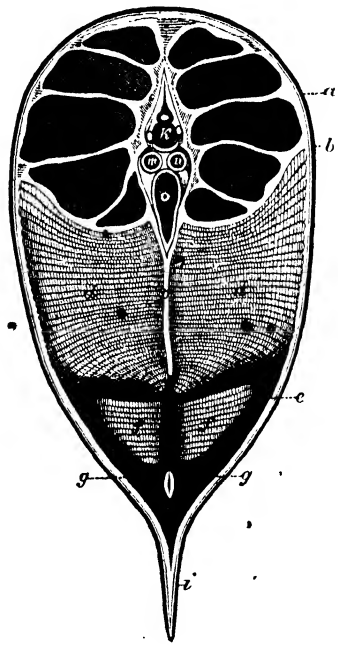


Lateral section of the electrical organs. *a*, Dorsal muscles; *b*, larger electrical organ; *c*, lateral fin muscles; *d*, lesser electrical organ; *f*, spinal chord; *g*, spinal chord; *h*, fifth pair of nerves; *i*, air-sac; *m*, membranous septum; *n*, edges of lateral fin muscles; *o*, cut dorsal muscles; *p*, body of vertebræ; *q*, larger electrical organs; *r*, lateral muscles; *t*, lateral fin muscles; *u*, fin.

a glass vessel, containing a porous vessel with the same solution. On passing a voltaic current through this arrangement. The solution becomes altered in character, and one side becomes positive to the other, and a second voltaic battery, having no relation to the first, is set up (fig. 53).

The anatomy of the electric eel (*Gymnotus Electricus*), from the rivers of South America, was described by John Hunter in the *Philosophical Transactions* for 1755. The eel has later been dissected by Dr. Letheby. He estimates the number of cells of the batteries at 550,000. Every cell is supplied by blood-vessels, and a nerve; but in

Fig. 55.



Transverse section of electrical eel. *a*, Skin; *b*, aponeurosis covering muscles and electrical organs; *d*, larger battery; *e*, lateral fin muscles; *f*, lesser batteries; *g*, edges of lateral fin; *i*, the fin; *k*, body of vertebræ; *m*, vein; *n*, artery; *o*, air-vessel, after Letheby.

this fish the nervous power is supplied by the spinal nerves, and not in the eighth pair as in the case of the electric ray. The batteries, two smaller and two greater, are arranged the length of the creature (fig. 54 and 55) in the

eel, whilst in the torpedo they are arranged vertically. Faraday found that the anterior part of the eel was positive to the posterior.

There are other electrical fish, such as the Silurus from the Nile, but it is sufficient for our purpose to notice the more remarkable and well-known species, which are competent to use the voltaic force, either for their own protection or the destruction of other creatures required for food.

In my early experiments I sought to ascertain how voltaic circuits could be formed, having properties analogous with those which are observed in the human frame. I found, that it was not difficult to form photo-voltaic circuits where the exciting cause of the voltaic force was light. The following solutions when part was exposed to light, and part retained in darkness, acted on the light side as the negative pole of a battery.

1. Mixed solutions of photo-sulphate of iron and nitrate of silver.
2. Mixed solutions of gallic acid and nitrate of silver.
3. Mixed solutions of oxalic acid and chloride of gold.
4. Mixed solutions of ferrocyanate of potash and ammonia, and pernitrate of iron..
5. Mixed solutions of ferrocyanate of potash and ammonia, pertartrate of iron.
6. Mixed solutions of ferrocyanate of potash and potassio-tartrate of iron.

Other solutions under the action of light excite a positive photo-voltaic circuit, such as—

1. Red ferrocyanate of potash and pernitrate of iron.
2. Bromine water, phosphorus water, and pernitrate of iron.

The voltaic circuit which is set in motion by sound, is probably not directly excited by the vibrations of sound itself, but from the vibrations acting on the bones of the ear giving rise to mechanical force.

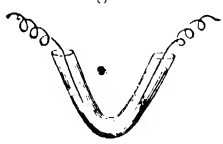
An artificial voltaic circuit may be originated by savours by placing in a V tube (fig. 56) a little persalt of iron on one side, and an infusion of meat on the other, when the voltaic force is immediately demonstrated.

An apparatus to exemplify the nose may be easily constructed by a moist sponge separated into two divisions by a membranous diaphragm, when on applying odours on one side the voltaic force is immediately developed (fig. 57).

For our sense of feeling it is easy to constitute voltaic circuits determined by heat. These I have called thermo-voltaic circuits, and may be exemplified in a variety of ways.

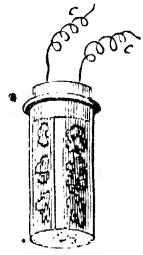
Electro-voltaic circuits may also be easily formed for

Fig. 56.



V tube.

Fig. 57.



Artificial nose.

any voltaic force, and will set in motion the voltaic apparatus of the skin.

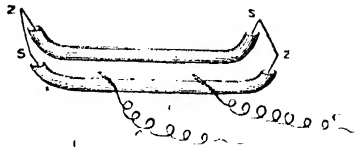
In like manner pressure on the skin deprives the termination of the nerve of the oxygenated blood corpuscle, and then voltaic force is exhibited.

In the manifestation of the effects of memory, the action on the brain produces results which regulate or give rise to further actions; this can readily be done in ordinary voltaic circuits, such as by passing a current of electricity through two iron wires, inserted in a solution of argento-cyanide of potassium. A deposit of silver would occur on the negative

wire, and the arrangement would be ever after an active voltaic circuit. In the brain the change must be effected on some organic compound, possibly in the cells contained in the vascular grey matter.

The nervous system of all animals, including man himself, is a voltaic circuit. It is composed of a set of elements in the body, one of the poles of which is in the organs of sensation, the other in the muscular system. The voltaic force passes by the nerves to the brain, where the particular action of the muscle excited to contract, is regulated or determined according to all the former actions which have taken place in the brain. To thoroughly form an idea of such an arrangement, it is desirable that complex forms of voltaic circuits should be continually under the mental observation and manipulation of those who would study The Natural System of Mental Philosophy.

Fig. 58.



Double voltaic battery, with mode of detecting the voltaic current in the fluid portion.

CONCLUSION.

RELATION OF MAN TO THE UNIVERSE.

The mind shows the wisdom and goodness of God : who has designed it to meet the wants of man.

Whether directly formed by His creative power : or progressively evolved according to His inscrutable ordinances.

The mind began by His Almighty Command : and must cease at His omnipotent will.

By mind man seeks his food : and makes his raiment.

He constructs habitations on the earth : and ships for the mighty deep.

He kindles fire for warmth : and employs all physical forces.

He contrives words to convey his thoughts : and writings to communicate his experiences to posterity.

He governs his family : and exercises dominion over every living thing.

He obtains knowledge of the universe from the pebble which rolls on the ground : to the countless worlds which revolve in the firmament.

He investigates nature : and his thoughts contemplate the Author of all things.

He seeks a knowledge of the laws of God : that he may obey the Divine will.

He accepts the moral law : that he may act rightly to his fellows.

He trusts to faith : to supply gaps in his knowledge.

He has recourse to prayer : to strengthen his holy desires.

He utters songs of praise : to mark the benefits he enjoys.

He has pleasure for his good : and suffers pain for his protection.

When he acts rightly he has joy : and the hope of everlasting reward.

When he acts wrongly it leads to pain : and the fear of everlasting punishment.

Who then would desire to limit the action of the mind : which proceeds from the noblest work of God.

Surely no man who appreciates the goodness and greatness of the Omnipotent : for he would rejoice in the works of the Almighty.

Such a man would sing as long as he had breath : Glory be to God Most High.'

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London: Printed by JOHN STRANGEWAYS, Castle Street, Leicester Square.

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